INSTRUCTION BOOK

318G

Automatic Direction Finder

Aircraft Radio Corporation • BOONTON • NEW JERSEY

DIFFERENCE DATA

FOR

TYPE 318G AUTOMATIC DIRECTION FINDER

(Supplement to Instruction Book for
Type 318A Automatic Direction Finder)

AIRCRAFT RADIO CORPORATION
Boonton, New Jersey

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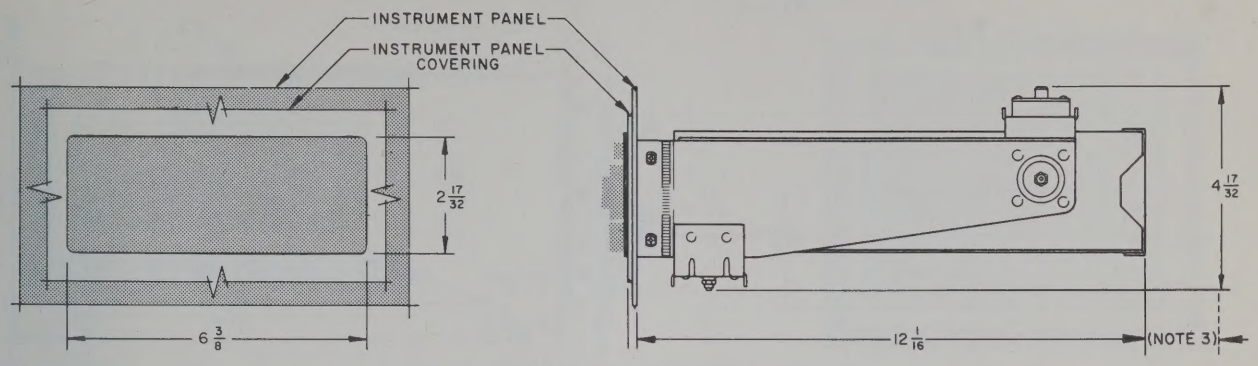
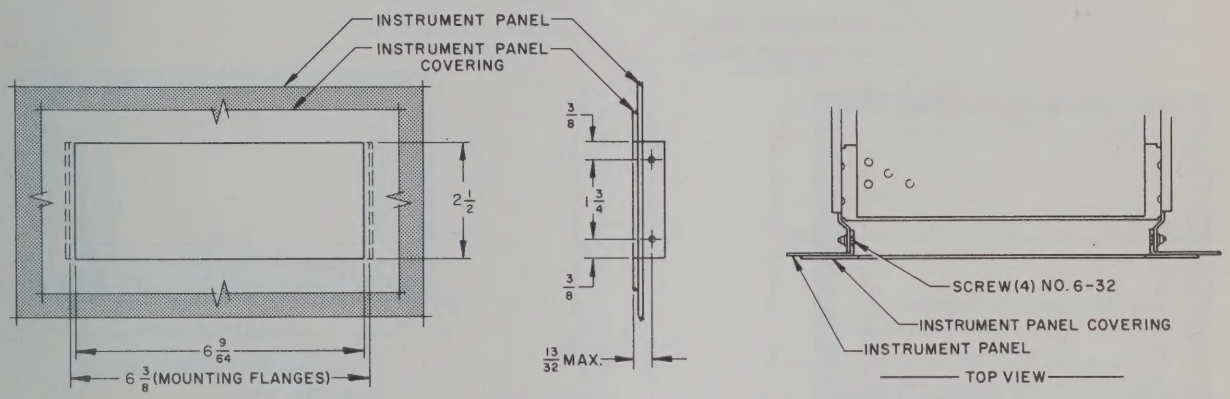
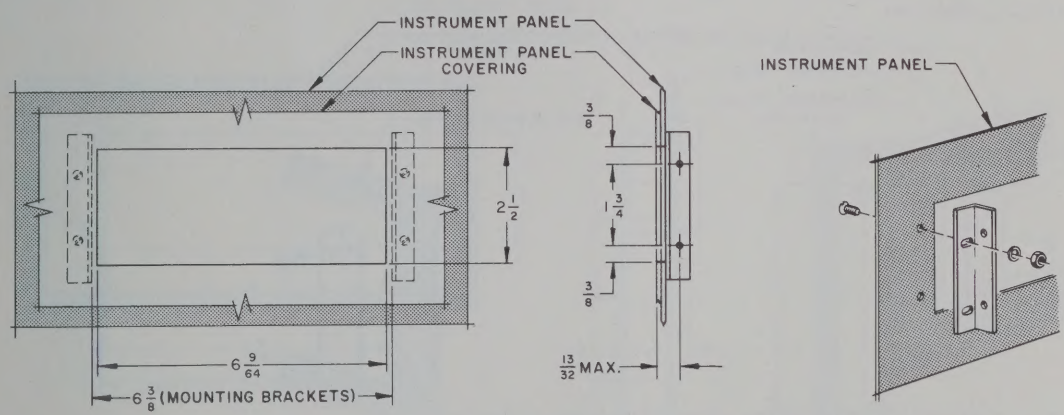


INSTALLATION DIMENSIONS



CUSTOM INSTALLATION DETAILS



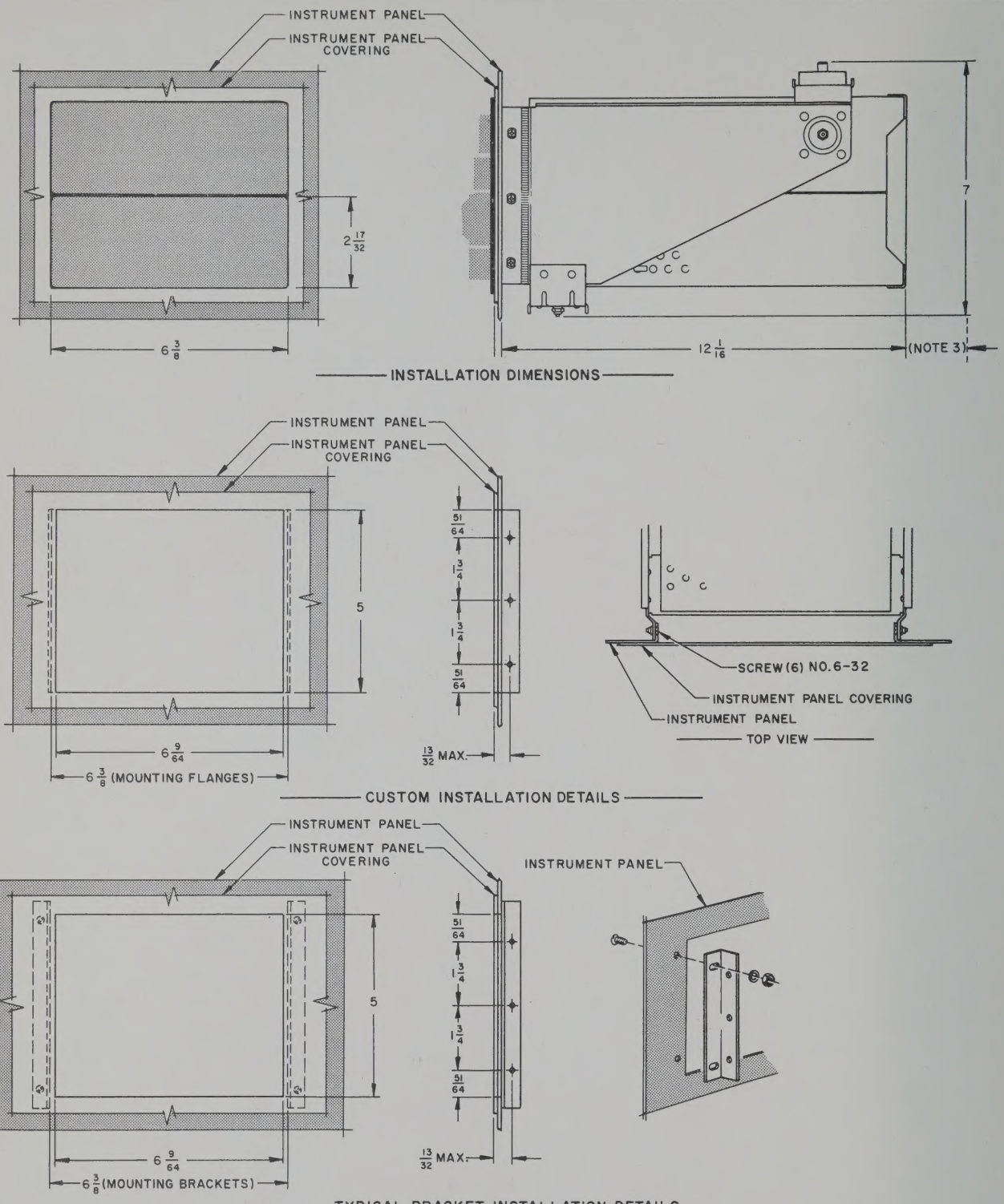
TYPICAL BRACKET INSTALLATION DETAILS

NOTES:

1. DIMENSIONS ARE IN INCHES.
2. WEIGHT: SEE TABLE 1.
3. ALLOW 2-1/2 INCHES FOR CABLE BEND AND CONNECTORS AT REAR OF UNIT.

TP4157

Figure 2. M-301G Mounting, Installation Diagram

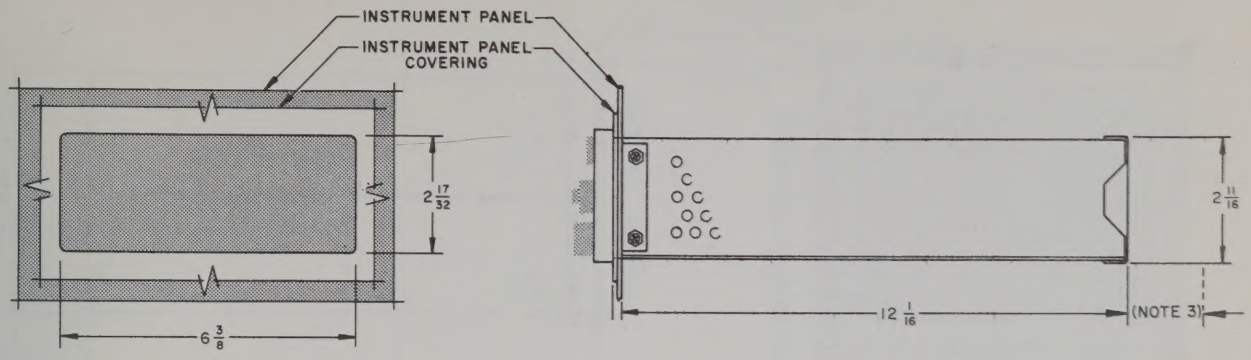


NOTES:

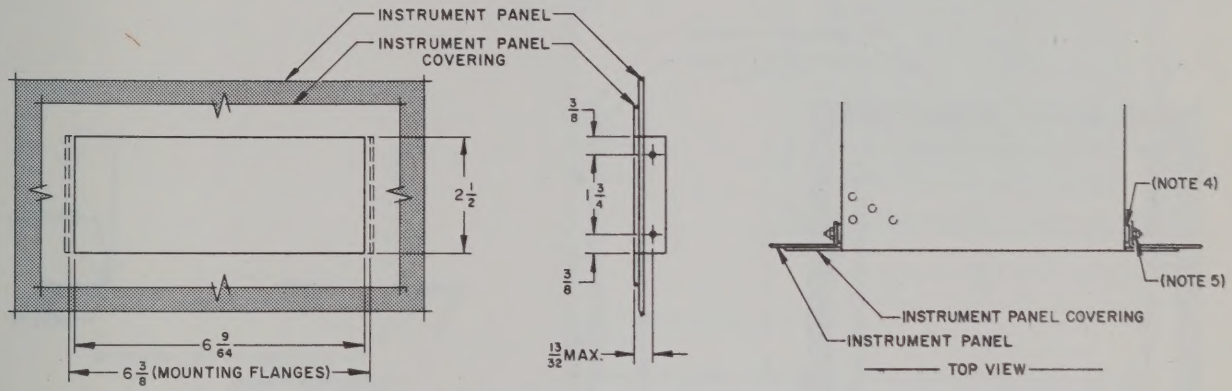
1. DIMENSIONS ARE IN INCHES.
2. WEIGHT: SEE TABLE 1.
3. ALLOW 2-1/2 INCHES FOR CABLE BEND AND CONNECTORS AT REAR OF UNIT.

TP4159

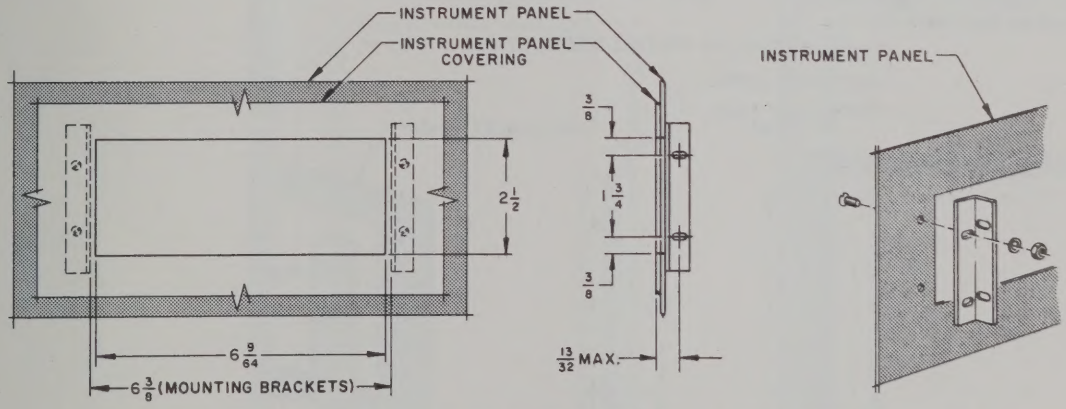
Figure 3. M-302G Mounting, Installation Diagram



INSTALLATION DIMENSIONS



CUSTOM INSTALLATION DETAILS



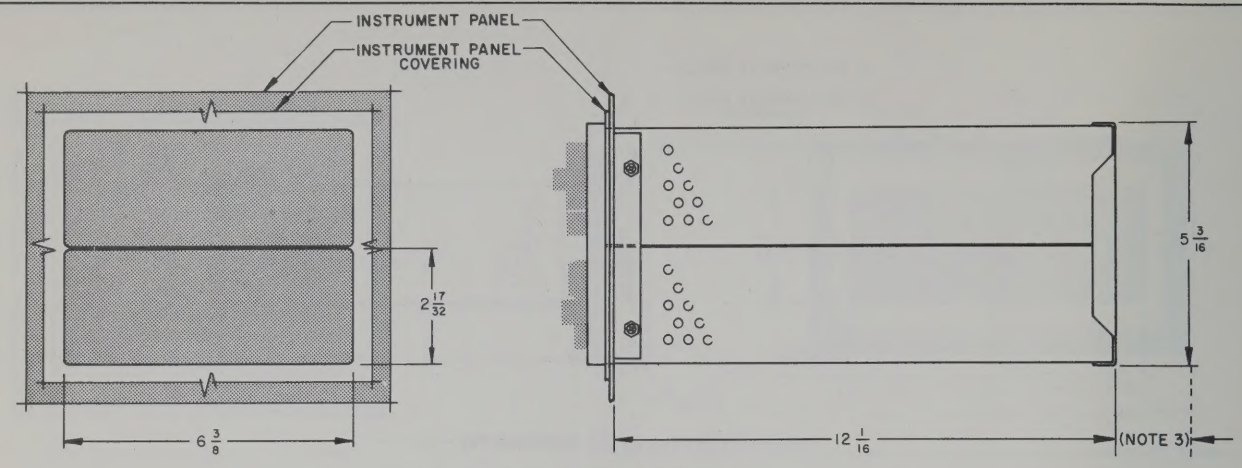
TYPICAL BRACKET INSTALLATION DETAILS

NOTES:

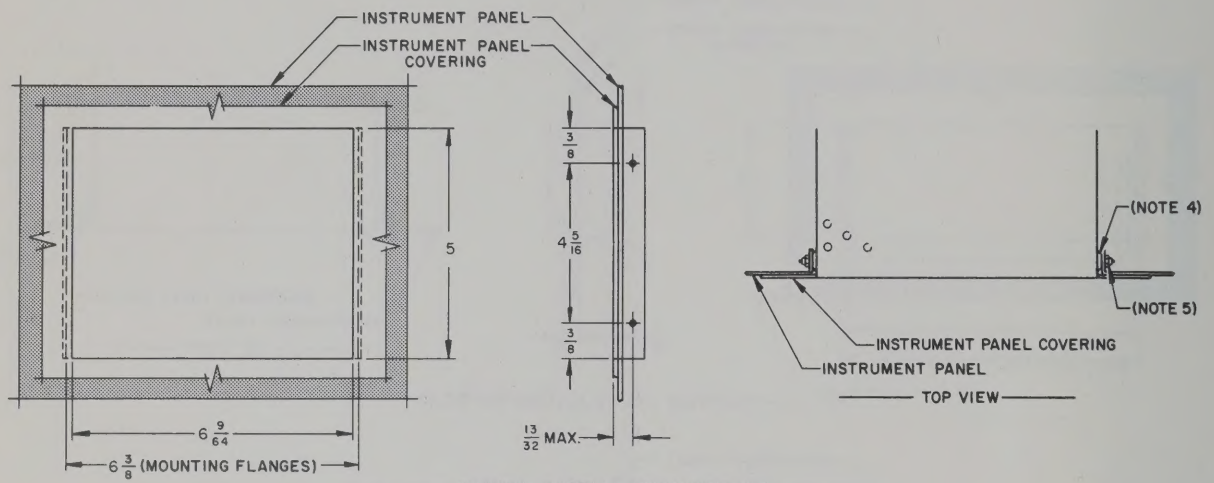
1. DIMENSIONS ARE IN INCHES.
2. WEIGHT: SEE TABLE 1.
3. ALLOW 2-1/2 INCHES FOR CABLE BEND AND CONNECTORS AT REAR OF UNIT.
4. IF NECESSARY, SHIM THE MOUNTING WITH WASHERS.
5. MOUNTING SCREWS AND STOPNUTS NOT SUPPLIED.

TP4161

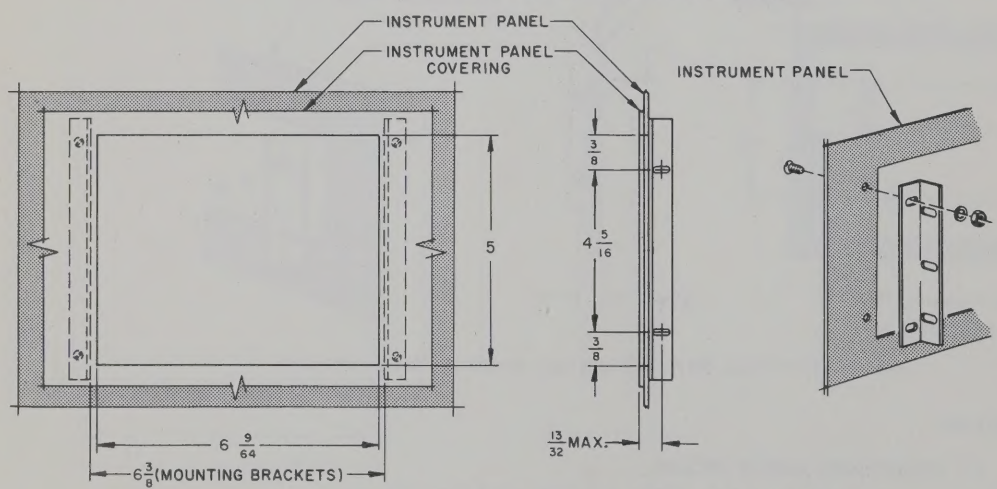
Figure 4. M-303G Mounting, Installation Diagram



INSTALLATION DIMENSIONS



CUSTOM INSTALLATION DETAILS



TYPICAL BRACKET INSTALLATION DETAILS

NOTES:

1. DIMENSIONS ARE IN INCHES.
2. WEIGHT: SEE TABLE 1.
3. ALLOW 2-1/2 INCHES FOR CABLE BEND AND CONNECTORS AT REAR OF UNIT.
4. IF NECESSARY, SHIM THE MOUNTING WITH WASHERS.
5. MOUNTING SCREWS AND STOPNUTS NOT SUPPLIED.

TP4163

Figure 5. M-304G Mounting, Installation Diagram

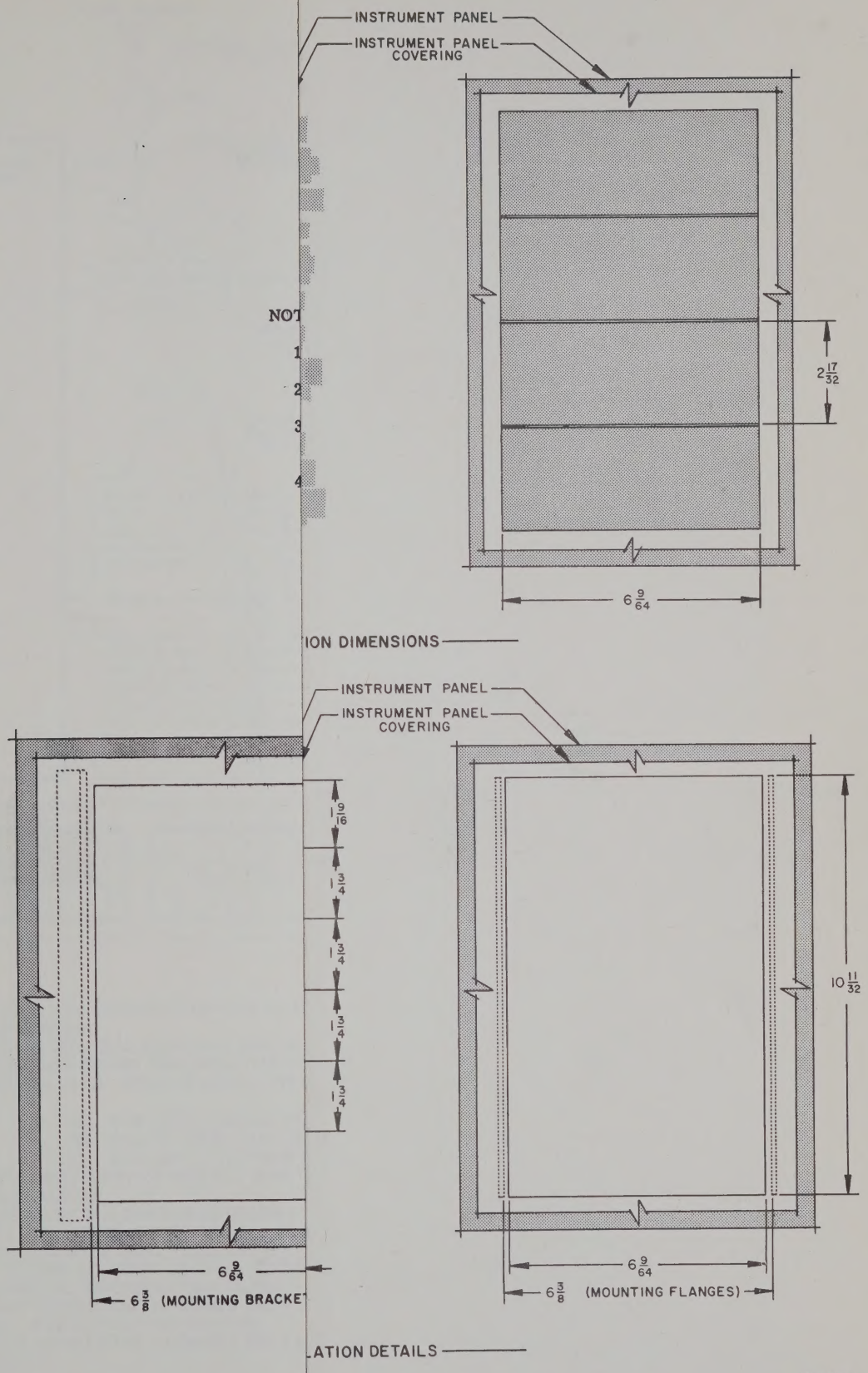
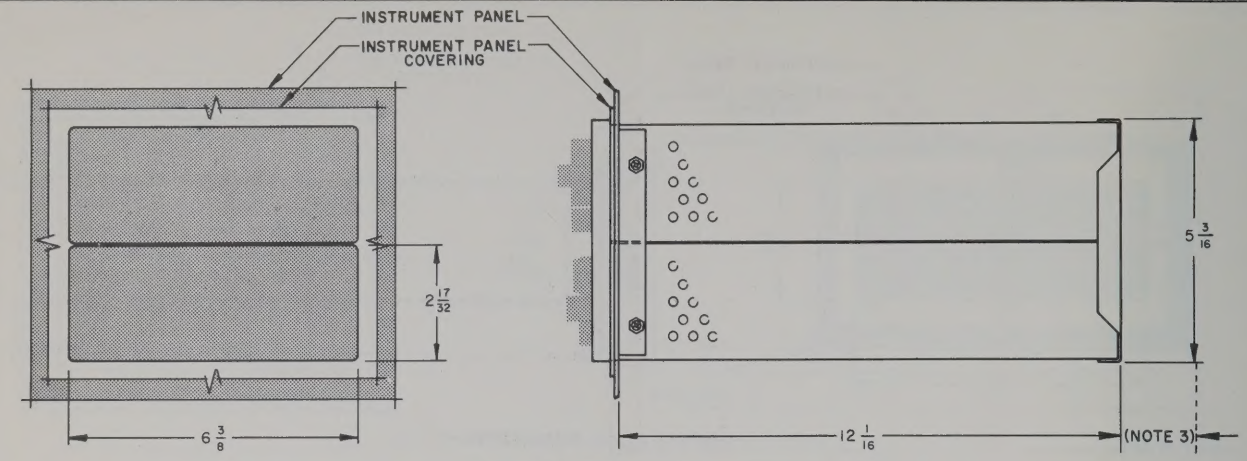
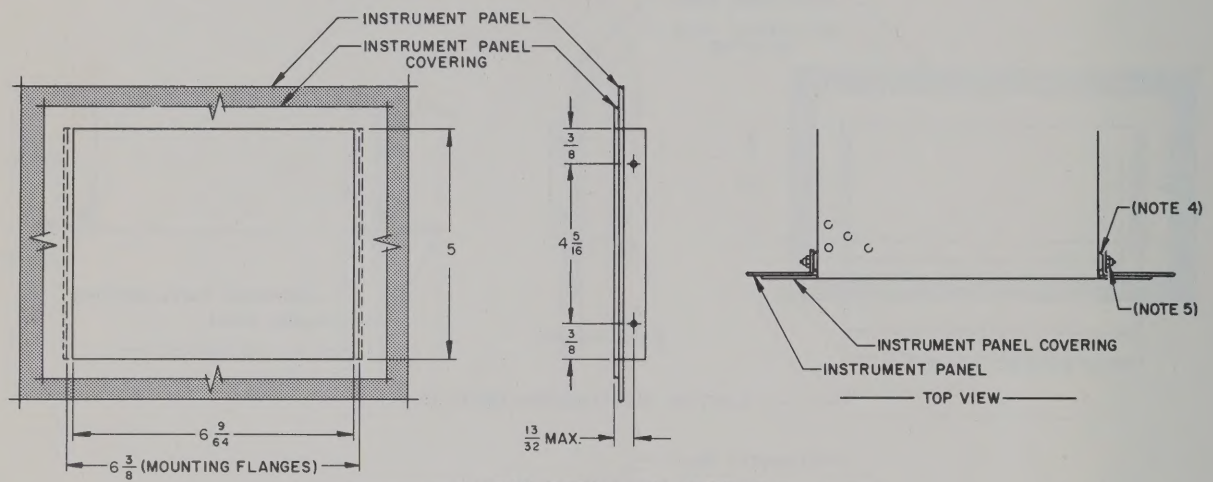


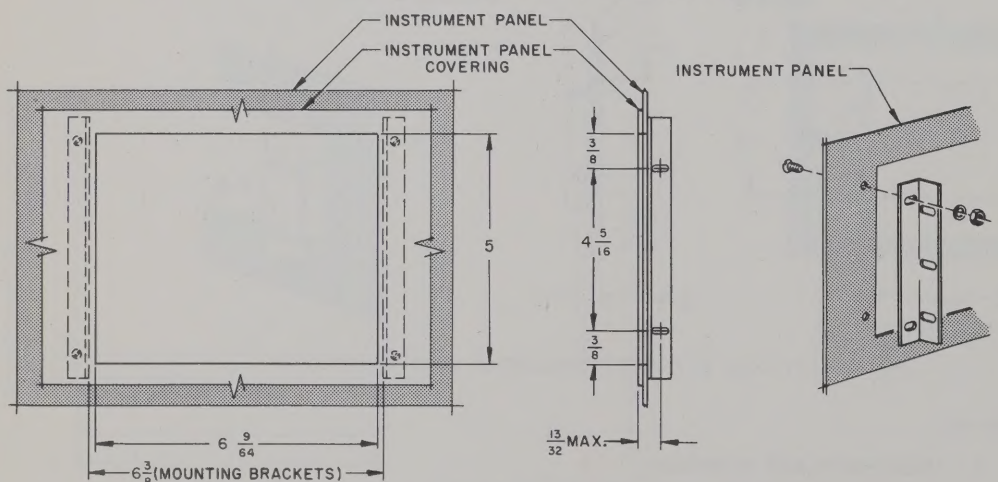
Figure 6. M-306G or M-306H Mounting, Installation Diagram



INSTALLATION DIMENSIONS



CUSTOM INSTALLATION DETAILS



TYPICAL BRACKET INSTALLATION DETAILS

NOTES:

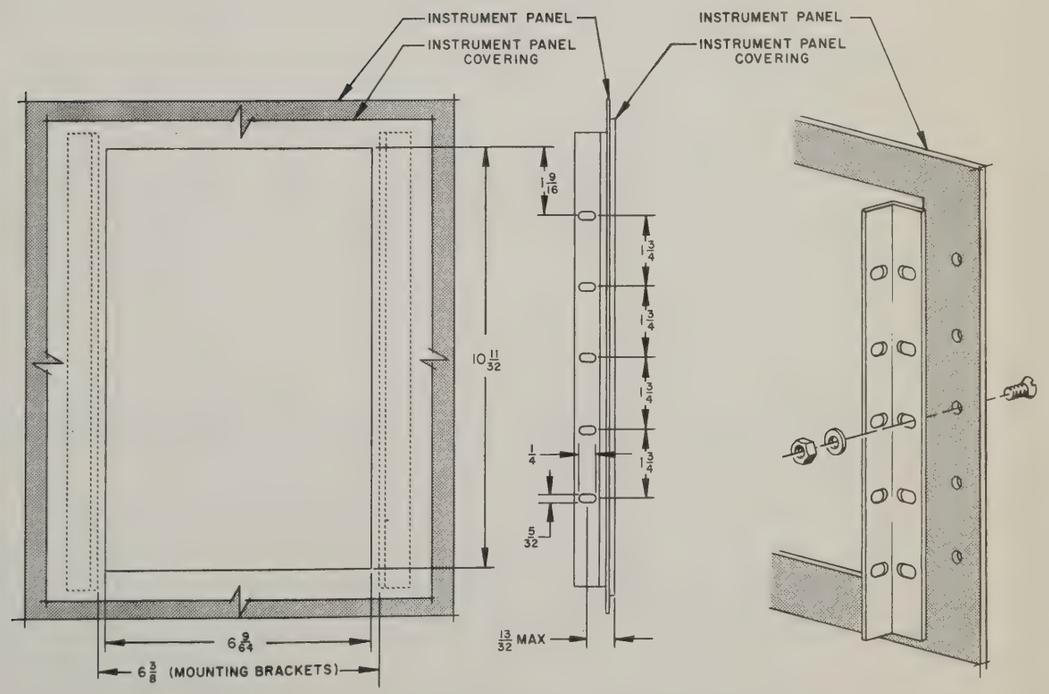
1. DIMENSIONS ARE IN INCHES.
2. WEIGHT: SEE TABLE 1.
3. ALLOW 2-1/2 INCHES FOR CABLE BEND AND CONNECTORS AT REAR OF UNIT.
4. IF NECESSARY, SHIM THE MOUNTING WITH WASHERS.
5. MOUNTING SCREWS AND STOPNUTS NOT SUPPLIED.

TP4163

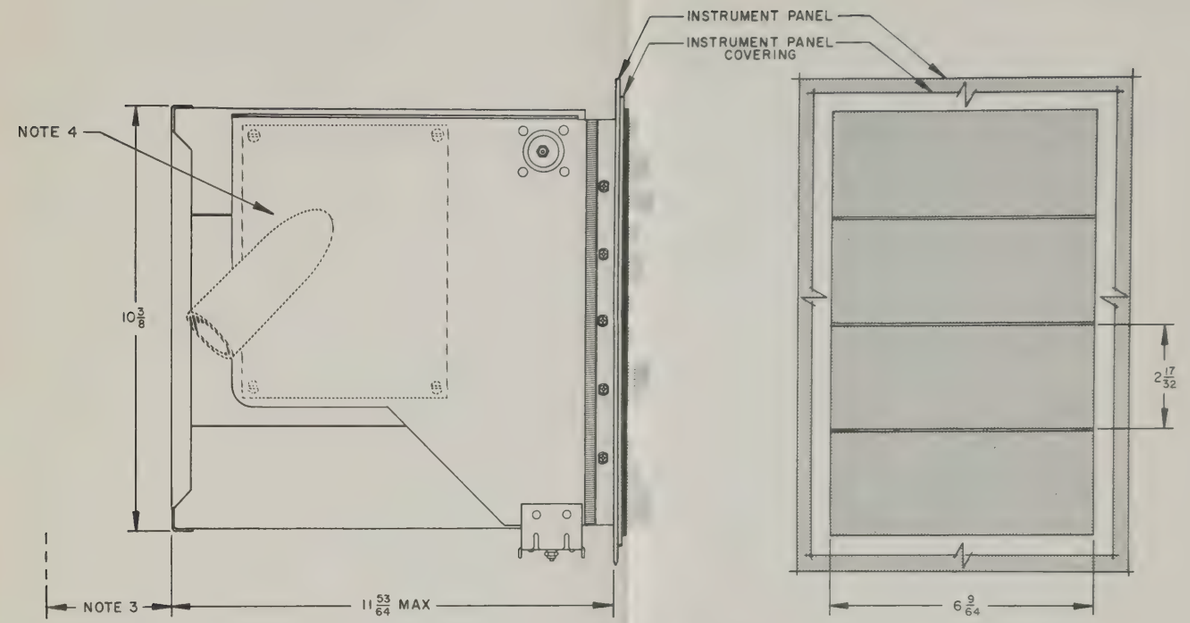
Figure 5. M-304G Mounting, Installation Diagram

NOTES:

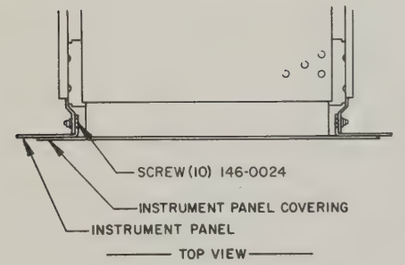
1. DIMENSIONS ARE IN INCHES.
2. WEIGHT: SEE TABLE 1.
3. ALLOW 2-1/2 INCHES FOR CABLE BEND AND CONNECTORS AT REAR OF UNITS.
4. PLENUM CHAMBER USED ON M-306G ONLY.



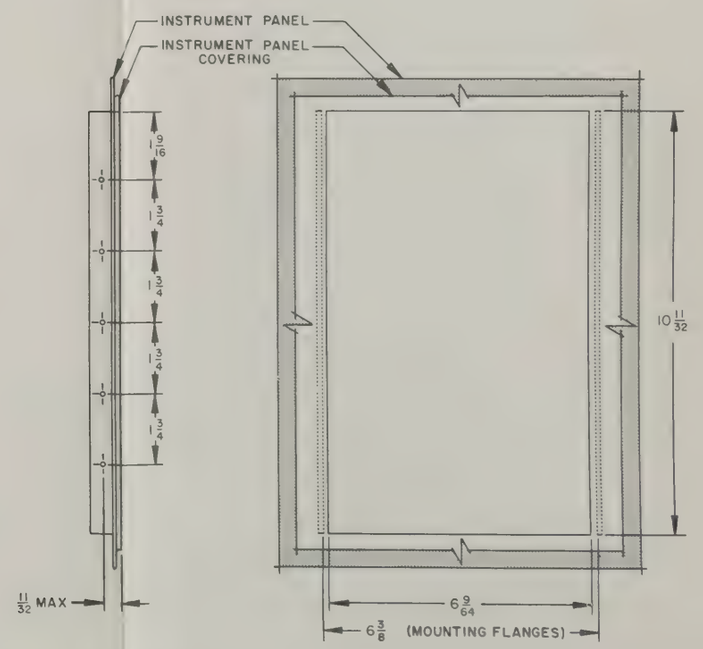
TYPICAL BRACKET INSTALLATION DETAILS



INSTALLATION DIMENSIONS



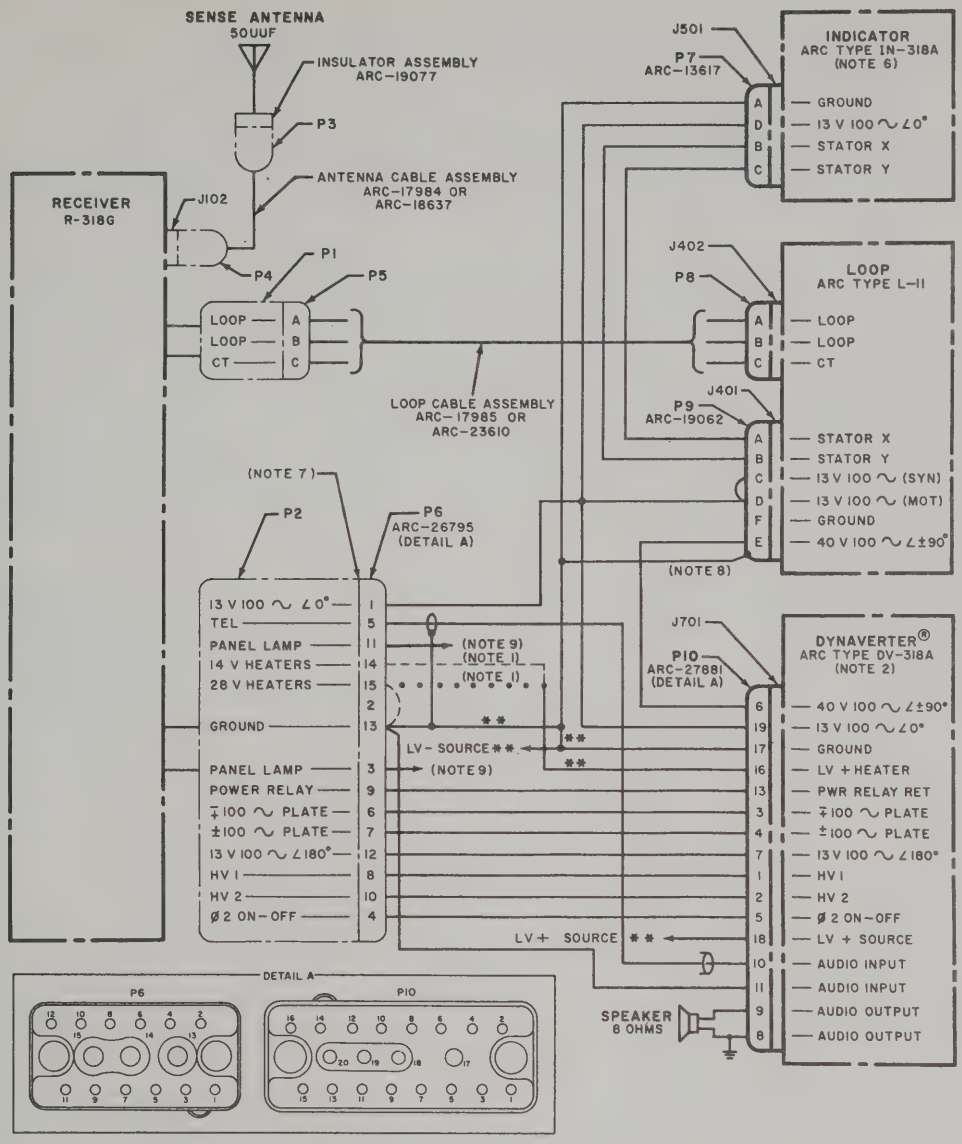
TOP VIEW



CUSTOM INSTALLATION DETAILS

TP4165

Figure 6. M-306G or M-306H Mounting, Installation Diagram



NOTES:

1. ---LINES INDICATE CONNECTIONS FOR 14-VOLT OPERATION. ••• LINE INDICATES CONNECTIONS FOR 28-VOLT OPERATION.
2. THE DV-318A IS VOLTAGE SENSITIVE AND MUST BE MATCHED TO SUPPLY VOLTAGE.
3. CONNECTIONS ARE SHOWN FOR BELLY-MOUNTED LOOP AND SENSE ANTENNAS. IF OTHER ANTENNA LOCATIONS ARE USED, INTERCHANGE CONNECTIONS AT UNITS AS FOLLOWS:

	DV-318A	IN-318A	R-318G
(A) TOP LOOP, BELLY SENSE	F & G	B & C	—
(B) BELLY LOOP, TOP SENSE	F & G	—	1 & 12
(C) TOP LOOP, TOP SENSE	—	B & C	1 & 12

4. FOR PROPER GROUNDING OF SYSTEM, AIRCRAFT SURFACE TO WHICH UNITS ARE ATTACHED MUST BE CLEAN, BARE METAL.
5. WIRES MARKED WITH A DOUBLE ASTERISK (**) ARE NO. 16 AWG STRANDED COPPER, FIBROUS-GLASS INSULATED. ALL OTHER WIRES ARE NO. 20 AWG STRANDED COPPER, FIBROUS-GLASS INSULATED.
6. IN-12 INDICATOR WITH 14491 PLUG MAY BE USED IN PLACE OF IN-318A OR IN-318A-1 INDICATOR.
7. CONNECT FILTER KIT 27873, IF USED, BETWEEN P2 AND P6.
8. CONNECT GROUND TO CONNECTOR SHELL.
9. FOR 14-VOLT OPERATION, CONNECT PIN 3 TO GROUND; CONNECT PIN 11 TO PANEL LAMP CONTROL (+14 VOLTS). FOR 28-VOLT OPERATION,
   FOR 28-VOLT OPERATION, CONNECT PIN 3 to PANEL LAMP CONTROL (+28 VOLTS); MAKE NO CONNECTION TO PIN 11.

TP4167

Figure 7. Type 318A with R-318G Receiver and DV-318A Dynaverter, Interconnection Diagram

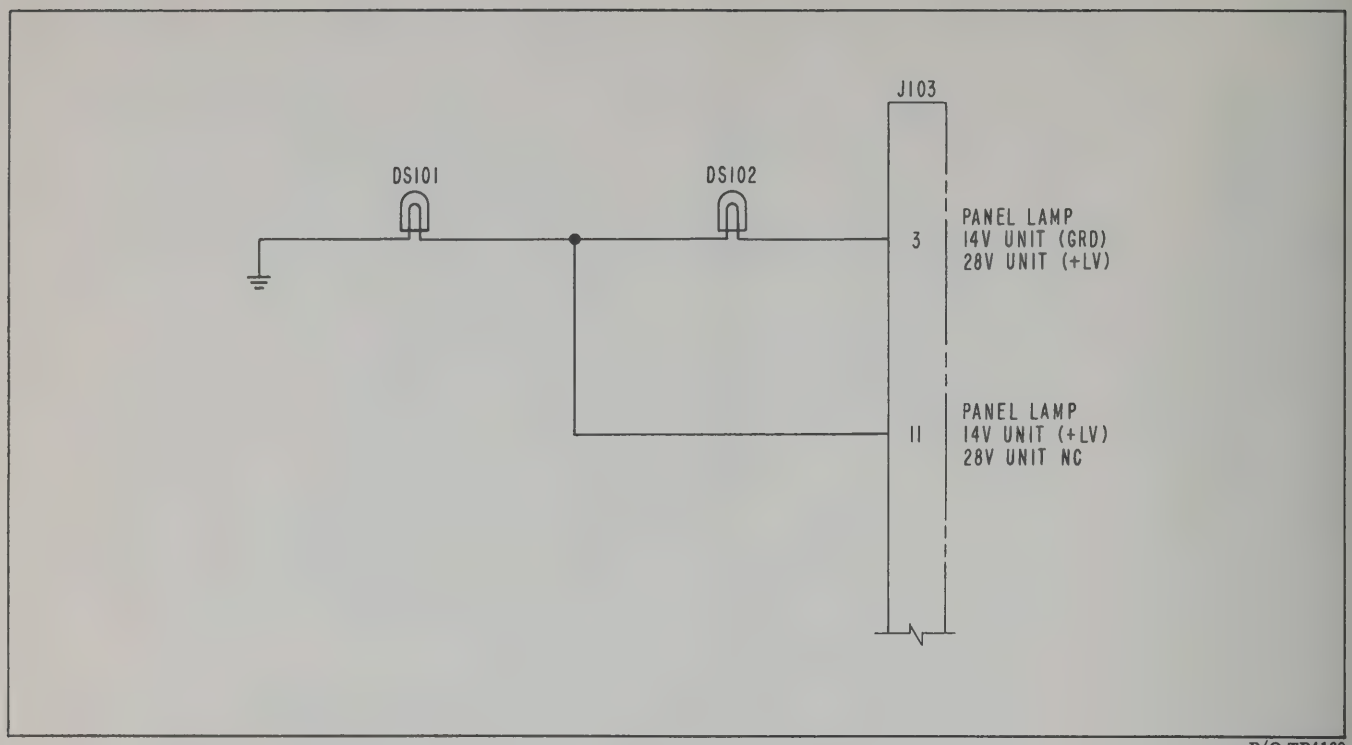


Figure 8. R-318G Receiver, Schematic Diagram

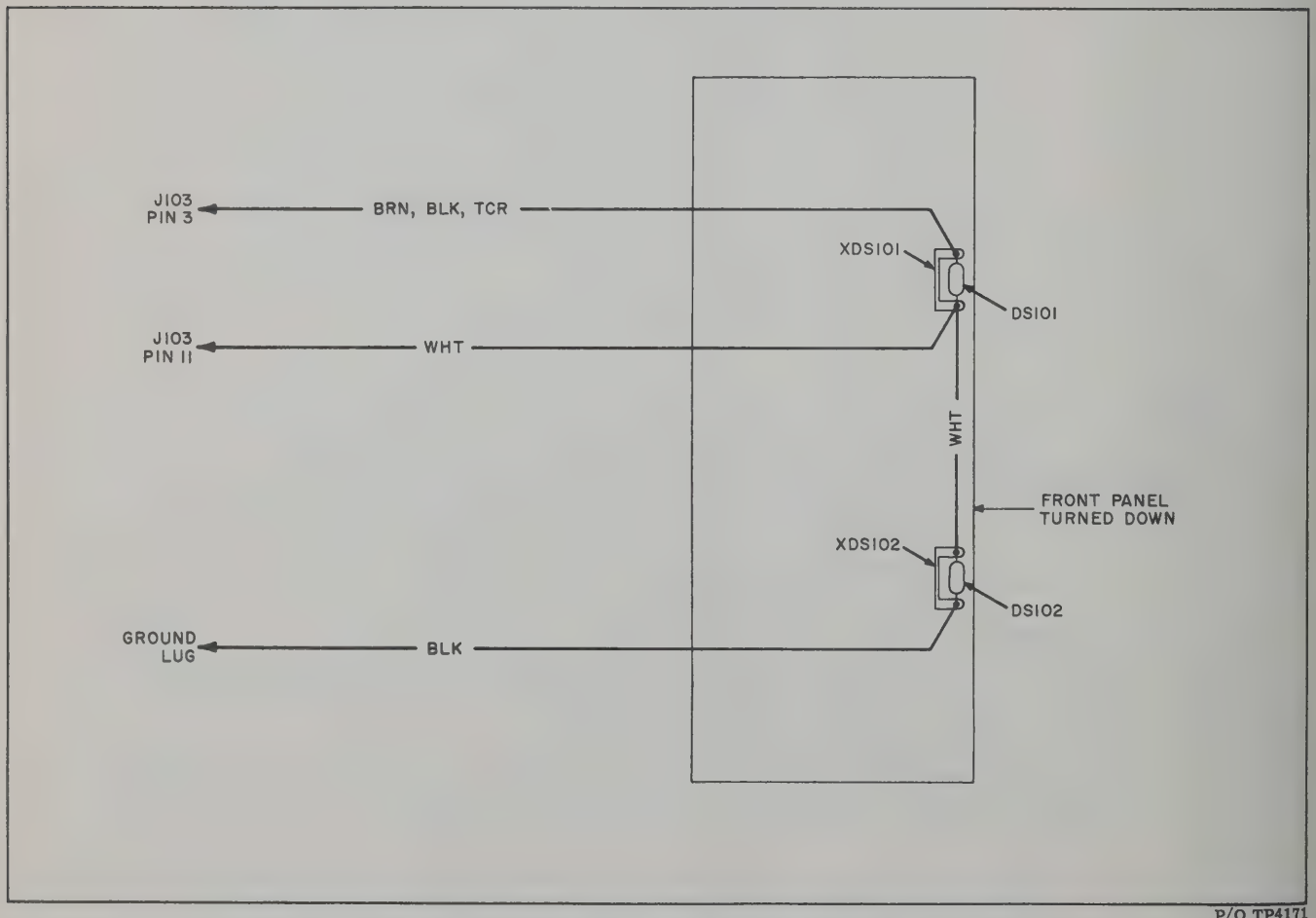


Figure 9. R-318G Receiver, Wiring Diagram

GENERAL INFORMATION

This supplement to the Type 318A instruction book contains information for the R-318G Receiver, shown in Figure 1. Information for the M-301G, M-302G, M-303G, M-304G, M-306G, and M-306H Mountings is also provided. The weights of the units are listed in Table 1. Unless otherwise noted, all R-318A information in the Type 318A instruction book applies to the R-318G.

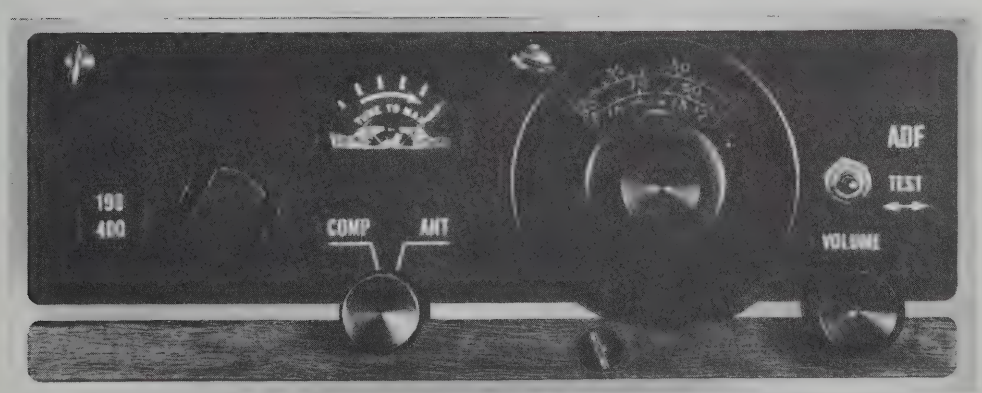
The major differences between the R-318A and the R-318G are the physical appearance of the front panel and the panel markings. Except for an additional panel lamp, the associated circuit, and the connection to the external panel lamp power control, the units are electrically identical. Two spacers are added on the rear of the R-318G chassis so that the length of the unit conforms to the "G" series mounting configuration.

Operating controls for the R-318G are mounted on a metal panel. Panel markings for function switch operation are on a plastic insert in the metal panel. A plastic dial mounted on the band switch shaft behind the front panel displays the selected frequency band through a window in the panel. The function switch, the band switch, the tuning meter, and the frequency dial are lighted by two red lamps which are soldered directly into the circuit. A rotatable pawl, controlled by a screw on the front panel, secures the R-318G to the mounting.

The M-301G Mounting and M-302G Mounting shock-mount one or two R-318G Receivers respectively. The mounting also serves as a dust cover for the unit. The mounting fits into a panel cutout and is secured to panel flanges by No. 6-32 flat head screws. Where shock-mounting is not required, the M-303G and M-304G Mountings are used for mounting one or two R-318G's respectively. The M-306G and the M-306H Mountings are four-bay shock mounts that mount the R-318G and three similar units. The M-306G includes a plenum chamber which is connected to the aircraft's ram air source. The plenum chamber routes the ram air to cool the units in the mounting.

TABLE 1. UNIT WEIGHTS.

Name	Designation	Weight (lb)
Mounting	M-301G	1.3
	M-302G	1.9
	M-303G	0.75
	M-304G	1.25
	M-306G	4.0
	M-306H	3.75
Receiver	R-318G	6.5



P/O TP1624

Figure 1. R-318G Receiver, Front Panel View

INSTALLATION

Install the R-318G and required mounting as follows:

Step 1. If a knockout panel of suitable size and mounting flanges are not provided on the aircraft instrument panel, cut the required opening in the panel. Fabricate two mounting brackets, as shown in Figure 2, 3, 4, 5, or 6. Both sides of the flanges or brackets should be clean, bare metal for proper grounding.

Step 2. Drill and countersink holes in the flanges or brackets, as shown in the applicable installation diagram.

Step 3. Position the mounting behind the instrument panel and fasten the mounting to the flanges or brackets with the specified hardware. Note that for the M-301G, M-302G, M-306G, and M-306H, the flanges or brackets are on the inside of the mounting, while for the M-303G and M-304G, they are on the outside of the mounting.

Step 4. Slide the R-318G into the mounting. Secure it in place by rotating the recessed locking screw near the lower edge of the front panel.

Step 5. If an M-306G Mounting is used, connect the plenum chamber on the mounting through a 1-1/2-inch I. D. rubber tube to a ram air source. The ram air source should be capable of an output of at least 7.5 cubic feet per minute.

INTERCONNECTION OF UNITS

The interconnection of the R-318G Receiver and the other units of the automatic direction finder is the same as for the R-318A except for the connection to the panel lamp power control. Figure 7 shows the R-318G connected in an ADF set using the DV-318A Dynaverter. As with the R-318A, the DV-14A Dynaverter or P-14A Power Unit may be used instead of the DV-318A Dynaverter.

PANEL LAMP REPLACEMENT

Two soldered-in panel lamps are used in the R-318G. To replace these lamps, remove the bezel from the R-318G front panel. Unsolder the defective lamp, and solder in the replacement. Replace the bezel.

INSTRUCTION BOOK

318G

Automatic Direction Finder

Aircraft Radio Corporation • BOONTON • NEW JERSEY

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ARCIB-318G-2
November 1964
Printed in U. S. A.

WARRANTY

Aircraft Radio Corporation warrants each new airborne product to be free of defects in workmanship and material for a period of twelve months from date of original installation. A defective product will be replaced or repaired (at ARC discretion) when returned to ARC, transportation prepaid, by an ARC authorized dealer or service agency. A statement establishing the date of installation must also accompany the defective unit.

Aircraft Radio Corporation will reimburse an ARC authorized dealer or service agency for labor charges and parts replacement incurred in the repair of defective products for a period of ninety days from date of original installation. Request for payment (or credit) must be made by an authorized ARC dealer or service agency on an ARC supplied form, number 1888A (Warranty Service Report and Invoice). Such charges shall be billed at the authorized dealer or service agency normal shop labor rates.

This warranty shall not apply to any ARC product which, in the judgment of ARC, has been repaired or altered in any way so as adversely to affect its performance or reliability or has been subject to misuse, negligence or accident. This warranty is in lieu of all other guarantees or warranties expressed or implied. The obligation and responsibility of ARC for or with respect to defective equipment shall be limited to that expressly provided herein and ARC shall not be liable for consequential or other damage or expense whatsoever therefor or by reason thereof.

ARC reserves the right to make changes in design or additions to or improvements in its equipment without obligation to make such changes or to install such additions or improvements in equipment theretofore manufactured.

ARC will make available repair components when requested by the authorized ARC dealer, using Form 1888A for these requisitions.

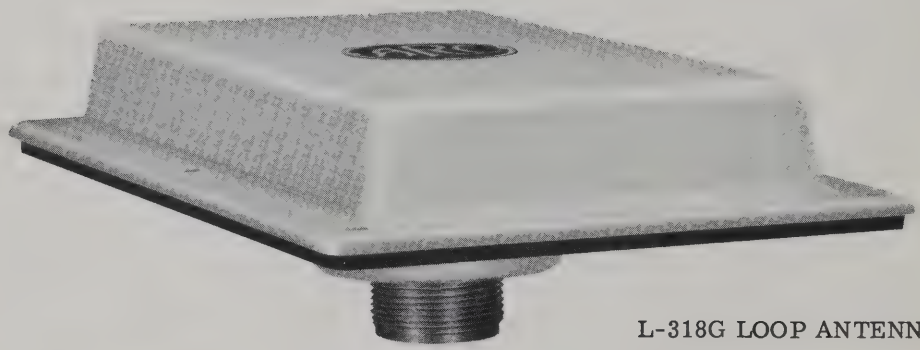
CONTENTS

ILLUSTRATIONS

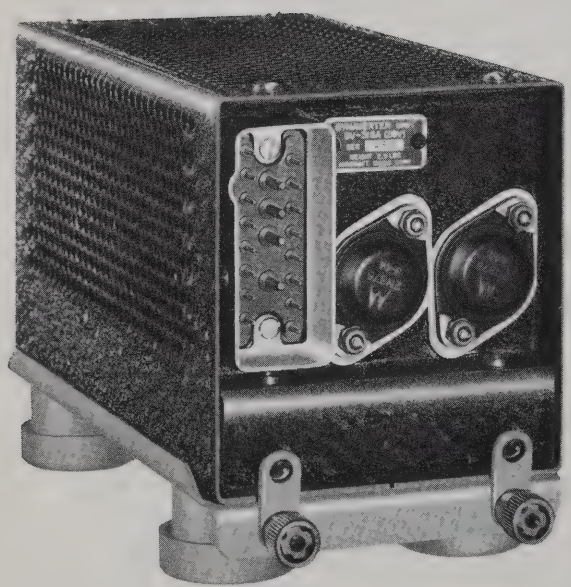
ILLUSTRATIONS - Continued

TABLES

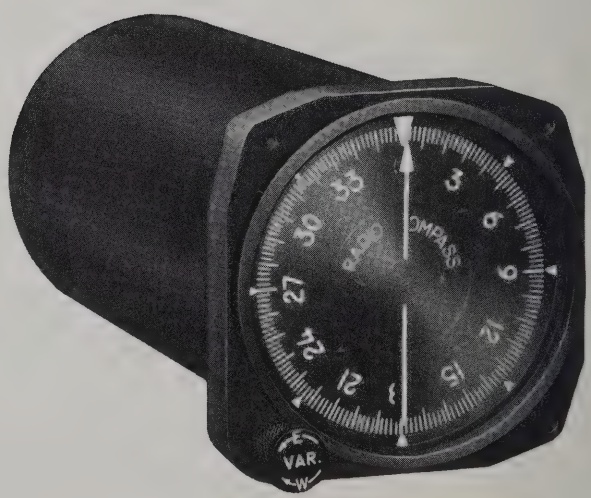
R-318G RECEIVER AND M-303G MOUNTING



L-318G LOOP ANTENNA



DV-318A DYNAVERTER
AND
M-28 MOUNTING



IN-21C
GONIOMETER-INDICATOR

TP1634

Figure 1-1. 318G Automatic Direction Finder, Major Units

SECTION I

GENERAL INFORMATION

1-1. INTRODUCTION.

This instruction book contains installation, operation, maintenance, and parts information for the 318G Automatic Direction Finder, manufactured by Aircraft Radio Corporation, Boonton, New Jersey.

1-2. PURPOSE.

The 318G is a panel-mounted automatic direction finder set which uses a fixed loop antenna to provide an automatic, continuous, visual bearing indication of the direction from which an r-f signal is being received. The set can be used for plotting position, homing, and aural reception of amplitude-modulated signals. It operates in the frequency range of 190 to 1750 kc, divided into three bands: 190 to 400 kc, 400 to 840 kc, and 840 to 1750 kc.

1-3. SPECIFICATIONS.

General Characteristics.

Frequency: 190—1750 kc

Tuning Bands: 190—400 kc, 400—840 kc, 840—1750 kc

Types of Operation:
- COMP: Automatic direction finder operation using both loop and sense antennas
- ANT: Communication receiver using sense antenna only
- BFO[1]: Identification of keyed CW signals

Total Maximum Input Power:
4.2 amperes at 13.75 volts dc or
1.9 amperes at 27.5 volts dc

R-318G Receiver.

Circuit: 14-tube superheterodyne

Sensitivity:
- COMP: 25 μv/meter for maximum of 2 degrees error and ±2 degrees jitter
- ANT (MCW): 10 μv/meter in series with 50 pf through standard input cable of 100 pf for a 6 db S+N/N input ratio

[1]Optional.

Image Rejection: At 380 kc, greater than 100 db; at 1750 kc, greater than 70 db

I-f Rejection: At 210 kc, greater than 100 db

Bandwidth (depending on frequency, kc off resonance, and modulated 30 per cent at 1000 cps): At 6 db, 3.3—4.1 kc; at 60 db, 9.1—11.1 kc

Intermediate Frequency: 142.5 kc

A-f Power Output: Approximately 1 watt into 300 ohms

Mounting: M-303G (M-301G, M-302G, M-304G, M-306G, and M-306H are optional)

DV-318A Dynaverter.

Input: Without audio amplifier: 2.6 amperes at 13.75 volts dc or 1.3 amperes at 27.5 volts dc

With audio amplifier: No load: 2.7 amperes at 13.75 volts dc or 1.4 amperes at 27.5 volts dc Normal load: 3.2 amperes at 13.75 volts dc or 1.6 amperes at 27.5 volts dc

Output Voltages:
- 14-volt units: 126 volts dc; 138 volts dc; 15 volts, 100 cps, Ø 0 degrees; 22 volts, 100 cps, Ø 180 degrees
- 28-volt units: 122 volts dc; 138 volts dc; 15 volts, 100 cps, Ø 0 degrees; 15 volts, 100 cps, Ø 180 degrees

Low-frequency Ripple: Less than 0.35 volt

Audio Amplifier Output: 4 watts

Mounting: M-28 (M-28A is optional)

1-4. UNITS AND ACCESSORIES.

The units and accessories which comprise the 318G ADF are listed in Table 1-1. Figure 1-1 illustrates the major units.

TABLE 1-1. UNITS AND ACCESSORIES

UNITS

Qty	Name	Type No.	Part No.	Over-all Dimensions (inches) Height	Width	Depth	Weight (pounds)
1	Receiver	R-318G	33230-0000	3-1/2	6-5/8	14-1/16	6.5
		R-318G-1[1]	33230-0200	3-1/2	6-5/8	14-1/16	6.5
1	Dynaverter	DV-318A(14v)[2]	26960-0014	3-5/8	3-3/8	6-3/4	2.9
		DV-318A(28v)[2]	26960-0028	3-5/8	3-3/8	6-3/4	2.9
1	Goniometer-Indicator	IN-21B[3]	32670	3-1/4	3-1/4	7-3/4	2.2
		IN-21C	33550	3-1/4	3-1/4	7-3/4	1.9
1	Loop Antenna	L-318G	33890-0000	4-5/16	7-1/16	2-1/16	1.6
1	Mounting (for DV-318A)	M-28	18350	1-13/16	3-9/16	7-3/16	0.4
		M-28A[3]	21650	1-13/16	4-1/8	7-3/16	0.55
1	Mounting (for R-318G)	M-301G[3]	33370	4-17/32	7-1/2	12-1/16	1.3
		M-302G[3]	33380	7	7-1/2	12-1/16	1.9
		M-303G	33490	2-11/16	6-7/16	12-1/16	0.75
		M-304G[3]	33500	5-1/4	6-7/16	12-1/16	1.25
		M-306G[3]	33190	11	9-1/2	12-1/16	4.0
		M-306H[3]	33680	11	7-1/2	12-1/16	3.75

ACCESSORIES

Qty	Name	Part No.	Weight (pounds)
1	Audio Amplifier Kit[2] [5]	27624-0014	0.56
		27624-0028	0.56
1	BFO Kit[5] consisting of:	33838	0.18
1	BFO Assembly	20639	
1	Cable (18 inches)	18327	
1	Capacitor (1 μf)	8791-9101	
1	Capacitor (1 μf)	21485-9101	
2	Lockwasher	8497	
1	Plate	33825	
2	Post	27947	
1	Resistor (100K)	201-0104	
1	Resistor (33K)	201-0333	
1	Screw	144-0016	
1	Sems, binding head	504-0016	
1	Switch	27948	
1	Wire (36 inches)	8761-0910	
1	Wire, green (9 inches)	8761-0510	
1	Wire, red (9 inches)	8761-0210	
1	Wire, blue (9 inches)	8761-0610	
1	Wire, yellow (9 inches)	8761-0410	
1	Wire, 6 inches	8819-0024	
1	Connector	33979	0.09
1	Connector Kit	26795	0.09
1	Connector Kit	27881	0.09
1	Doubler Plate[5]	33237	0.18
1	Loop Antenna Cable Assembly (20 feet)	32803	1.2
4	Post[5]	33441	
1	Receiver Cable Assembly (4 feet)	33488-0001	0.18
1	Sense Antenna Cable Assembly[4] (7 feet)	17984-0000	0.31
	(14 feet)	18637-0000	1.06
1	Sense Antenna Kit[5] consisting of:	19210	0.34
1	Antenna Wire (30 feet)	12447	
1	Connector	19356	
2	Insulator	12243	
1	Insulator Assembly[6]	19077	
1	Shackle	19357	
1	Spring	12413	
1	Thimble	12324	

[1]Available on special order; contains factory-installed BFO kit.
[2]14-volt or 28-volt unit supplied, as specified.
[3]Available on special order; refer to paragraph 1-5.
[4]7-foot or 14-foot cable length supplied as specified.
[5]Available on special order; refer to paragraph 1-6.
[6]Available as separate item on special order.

1-5. DESCRIPTION OF UNITS.

Receiver. The R-318G Receiver is a panel-mounted superheterodyne receiver covering the frequency range of 190 to 1750 kc in three bands. Manual band switching and tuning are accomplished by controls located on the front panel of the receiver. For automatic direction finding, the receiver uses a sense antenna and a loop antenna. For conventional reception, the receiver uses a sense antenna only.

Subminiature tubes and wired-in, replaceable subassemblies are used in the receiver. The tuning capacitor is a five-section, ganged, variable capacitor constructed so that its capacitance decreases with a temperature rise. This tuning capacitor operates with fixed, temperature-compensating capacitors to obtain stable operation over a wide frequency range. There is negligible change in sensitivity and selectivity over the temperature range of -55°C (-67°F) to +71°C (+179.8°F). The i-f section, tuned to 142.5 kc, consists of three double-tuned transformers and two electron tubes. Fifteen r-f transformers are used in the r-f section, five for each frequency band. All r-f and i-f transformers are preset in inductance, filled with nitrogen, and hermetically sealed.

Controls for the ADF set are located on the receiver front panel. These include a tuning control, a tuning meter, a combined on-off switch and volume control (VOLUME), a band selector switch, a function selector switch, and a compass-test switch (TEST).

The tuning control tunes the receiver; a tuning meter provides a visual indication of the accuracy of the tuning. The VOLUME control is a combined switch and dual potentiometer. The switch controls the application of primary voltage to the ADF set. One of the potentiometer sections is used as an audio gain control, while the other is used as an r-f sensitivity control. The band selector switch selects the desired tuning range by controlling the position of a six-gang wafer switch in the r-f section of the receiver.

The function switch is a two-position rotary switch. When the switch is in the COMP position, both the loop and sense antennas are connected and the ADF set functions as an automatic direction finder; also, the loop and modulating circuits of the receiver are energized, full avc is switched in, and the VOLUME control regulates the audio gain. When the function switch is in the ANT position, only the sense antenna is connected and the receiver functions as a conventional communication and low-frequency radio range receiver. Under this condition, the loop and modulating circuits of the receiver do not operate, and the VOLUME control functions as an audio and r-f sensitivity control without avc. The absence of avc permits the detection of small changes in signal strength for low-frequency range navigation.

The TEST switch is a spring-loaded, double-throw, center-off toggle switch. When the function switch is in the COMP position, the TEST switch is used to determine whether the goniometer-indicator reading is produced by a reliable signal. With the TEST switch closed, a test voltage is applied to the servo amplifier of the receiver, driving the goniometer-indicator pointer in the direction in which the switch is held (left or right). This test voltage overrides the signal circuits, and the pointer of the goniometer-indicator rotates independently of the received signal, away from its original position. When the TEST switch is released, the pointer returns to its original position. This test proves that the ADF set is operating properly and that the received signal is strong enough to duplicate the indicator reading whether approached from a clockwise or counterclockwise direction.

All electrical connections to the receiver are made through two cable assemblies at the rear of the unit. The sense antenna cable assembly is connected at one end to a fixed right-angle connector. For shock-mounting, the receiver requires an M-301G Mounting for single-unit installation or an M-302G Mounting for dual-unit installation. The M-303G or M-304G Mounting is used where shock-mounting is not required. The M-306G or M-306H Mounting is used where a quadruple-unit shock-mounting is required. The M-306G has a plenum chamber for forced-air cooling. A rotatable pawl, controlled by a screw on the front panel, secures the receiver to the mounting.

Dynaverter. The DV-318A Dynaverter is an all-transistor power converter. It furnishes all a-c and d-c voltages (except primary power) required for operation of the ADF set. A two-transistor, multivibrator switching circuit and a full-wave rectifier generate the high d-c voltages. The filter circuit for the high-voltage d-c output is a capacitor-input filter using two chokes in series and a capacitor connected across the output. A two-transistor, push-pull power oscillator generates the 100-cps a-c voltages. An optional audio amplifier, which is mounted on the Dynaverter chassis, is available on special order.

The Dynaverter requires an M-28 Mounting for installation. An M-28A Mounting is available for a shock-mount installation. Each mounting is equipped with two nut and link arrangements which engage cone-shaped studs on the Dynaverter to secure the unit in place.

Loop Antenna. The L-318G Loop Antenna consists of two insulated coils wound at right angles to each other on a flat ferrite core. The high permeability of the ferrite core concentrates the r-f field in the loop coils, resulting in a sensitivity equal to that of an air-core loop antenna many times larger. The non-symmetrical winding of the loop coils provides a fixed 7.5° of compensation in the loop antenna. The coils and ferrite core are encapsulated in lightweight foam and housed in a hard plastic shell. The loop antenna is mounted on the exterior surface of

the aircraft. An arrowhead, impressed on the plastic shell, indicates the forward direction of the loop antenna. The centerline of the loop antenna is indicated by the index marks on the fore and aft edges. Electrical connections are made through a seven-pin connector.

Goniometer-Indicator. The IN-21C Goniometer-Indicator is normally supplied with the ADF set; however, if remote indicators are used, an IN-21B Goniometer-Indicator is required. Both indicators incorporate the functions of a rotating loop antenna and a bearing indicator into a single unit.

The IN-21C Goniometer-Indicator contains an r-f goniometer, servomotor, compensation mechanism, and gearing unit. The rotating dial is marked every 2°, with major markings every 10°, and numerical markings every 30°. The dial is positioned by a variation knob (marked VAR.) located on the front of the goniometer-indicator.

The IN-21B Goniometer-Indicator differs from the IN-21C Goniometer-Indicator only in that the IN-21B also contains a synchro transmitter which permits its bearing indication to be repeated on conventional bearing indicators, such as the single-pointer IN-12-1 (23710), double-pointer IN-13A-1 (27470), and IN-16A RMI (27226).

In both goniometer-indicators, the internal wiring is determined by the location of the loop and sense antennas. The goniometer-indicators are factory-wired for a top sense antenna and a bottom loop antenna installation. Any other combination of antenna locations requires that simple wiring changes be made within the goniometer-indicators as indicated in Figure 2-10. The wiring changes, if required, should be made before installation of either goniometer-indicator is started.

Mountings. The M-301G Mounting and the M-302G Mounting are used to shock-mount one or two receivers, respectively. The mounting also serves as a dust cover for the receiver. The mounting fits into a panel cutout and is secured to the panel flanges by No. 6-32 flat head screws. Where shock-mounting is not required, the M-303G and M-304G Mountings are used to mount one or two receivers, respectively. The M-306G and M-306H Mountings are four-bay shock-mounts that mount the receiver and three similar units. The M-306G includes a plenum chamber which is connected to the aircraft's ram air source. The plenum chamber routes the ram air to cool the units in the mounting.

The M-28 or M-28A is used for mounting the Dynaverter. The M-28A is a shock-mounting. The M-28 and M-28A are interchangeable functionally but not physically because of different over-all mounting dimensions.

1-6. DESCRIPTION OF ACCESSORIES.

Audio Amplifier Kit. Audio Amplifier Kit 27624-0014 (14v) or 27624-0028 (28v) is a four-watt audio amplifier which is mounted on the Dynaverter chassis. The audio amplifier employs a two-transistor, class B power amplifier to provide the necessary audio output required for cabin speaker operation.

BFO Kit. The Beat Frequency Oscillator (BFO) Kit 33838 contains the parts necessary to fabricate and install a BFO in the receiver. A three-position rotary switch and a printed nameplate are included in the kit. The three-position rotary switch replaces the two-position function switch originally mounted on the receiver front panel. The printed nameplate is mounted on the front panel to identify the positions of the three-position switch.

Connector and Kits. Connector 33979 and Connector Kits 26795 and 27881 are used in fabricating the interconnecting cable assembly. Connector 33979 mates with J2 of the goniometer-indicator. Connector Kit 26795 mates with P2 of the receiver, and Connector Kit 27881 mates with J701 of the Dynaverter.

Doubler Plate. Doubler Plate 32237 is used to facilitate the installation of the loop antenna. When secured to the aircraft skin, it allows the loop antenna to be removed or reinstalled easily. The doubler plate also acts as a stress distributor, minimizing the stress on the aircraft skin at each mounting point.

Loop Cable Assembly. Loop Cable Assembly 32803 is used to connect the loop antenna to the goniometer-indicator. The loop cable assembly is twenty feet long, terminated at one end with a 32806-0001 connector and at the other end with a 32805-0001 connector. The length of the cable assembly is critical and should not be altered.

Post. The four Posts 33441 facilitate the installation of the loop antenna. When attached to the four corners of the loop antenna, they provide the clearance for the loop cable assembly and loop antenna connector that is required during the loop antenna installation procedure. Also, the pointed ends of the posts aid in locating the center of the mounting holes for the loop antenna.

Receiver Cable Assembly. The Receiver Cable Assembly 33488-0001 is used to connect the receiver to the goniometer-indicator. The receiver cable assembly is four feet long, terminated at one end with a 12371 connector and at the other end with a 33872-1003 connector. The length of the cable assembly is critical and should not be altered.

Sense Antenna Cable Assembly. Either Sense Antenna Cable Assembly 17984 or Sense Antenna Cable Assembly 18637 is used to connect the sense antenna to the receiver. Sense Antenna Cable Assembly 18637 is a 14-foot length of RG-114A/U coaxial cable terminated at each end with a 18767 connector. Sense Antenna Cable Assembly 17984 is a 7-foot length of RG-62/U coaxial cable terminated at each end with a UG-260/U (12955) connector. Each cable assembly has a capacity of 100 ±5 pf. The length of the cable assemblies is critical and should not be altered.

Sense Antenna Kit. The Sense Antenna Kit 19210 includes all the parts necessary for constructing and installing a sense antenna. Insulator Assembly 19077 is supplied with the sense antenna kit and may also be supplied individually. The insulator assembly is used for coupling the sense antenna to the antenna cable assembly. It is desirable that this insulator assembly, or its equivalent, be used to retain the electrical characteristics of the antenna cable assembly.

1-7. FUNCTIONAL DESCRIPTION.

General. The ADF set provides navigation bearings on any continuous radio signal between 190 and 1750 kc. It also functions as a low-frequency radio range receiver and a communication receiver. If the optional BFO kit is installed, keyed CW signals may be identified.

Radio Compass Operation. A block diagram is shown in Figure 1-2. With the function switch of the receiver in the COMP position, the set functions as follows: An r-f voltage is induced in the loop antenna which is 90° out of phase with the r-f voltage in the sense antenna. The magnitude of the induced voltage is altered to produce 7.5° of compensation. The voltage induced in the loop antenna coils is connected to the stator windings of the goniometer, B2, in the goniometer-indicator. The stator windings produce an r-f field identical to the compensated field of the loop antenna. The r-f field in the goniometer is searched by the goniometer rotor. A voltage, which is a function of the rotor angular position, is induced in the rotor winding. This rotor voltage, supplied as a loop input signal to the receiver, is amplified by the loop amplifier, V101, and phase-shifted 90°, resulting in an amplified r-f voltage that is either in phase or 180° out of phase with the sense antenna voltage.

The phase-shifted r-f voltage is fed to the balanced modulator, V102. The balanced modulator has a 100-cps modulating voltage applied by the Dynaverter to each half, in opposite phase, to provide an output voltage consisting of the carrier frequency plus or minus the modulating frequency. These fre-

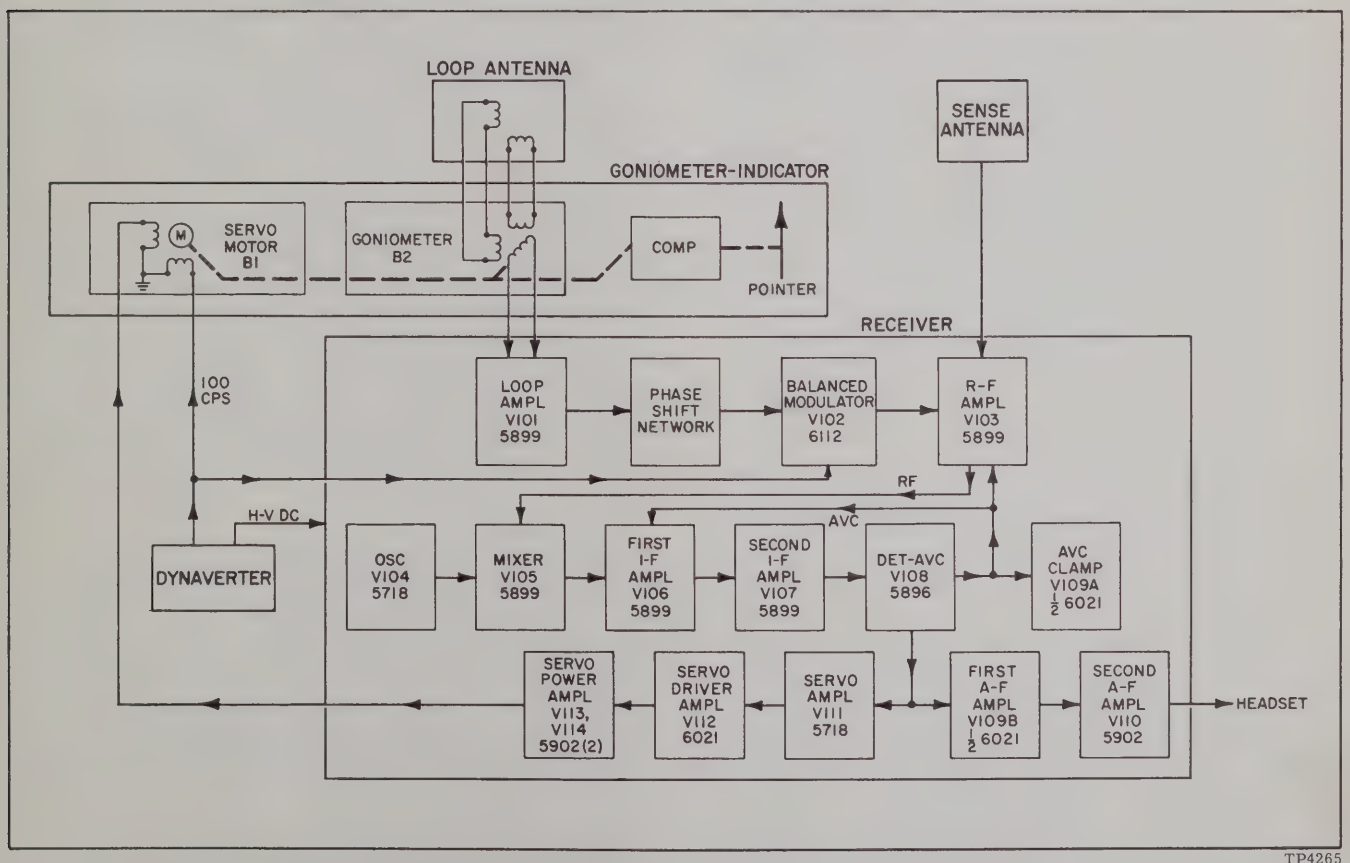


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Figure 1-2. 318G Automatic Direction Finder, Block Diagram

quencies appear at the r-f amplifier, V103, and will add or subtract from the original carrier frequency supplied by the sense antenna. The summation of the frequencies depends upon whether the loop antenna voltage is in phase or 180° out of phase with the sense antenna voltage.

The output of V103 is combined with the output of local oscillator V104 in the mixer, V105. The mixer produces an i-f voltage that is fed through i-f amplifiers V106 and V107 to the detector-agc stage, V108. The detector detects the 100-cps modulation. The output of V108 is fed through servo amplifier V111, servo driver amplifier V112, and servo power amplifier V113 to the control winding of the servo motor, B1, in the goniometer-indicator. The 100-cps output of the Dynaverter is fed to the reference winding of the servo motor.

The rotor of the servo motor and the goniometer are mechanically linked. The direction in which the motor drives the goniometer rotor depends upon whether the voltage phase of the motor control winding leads or lags the voltage phase of the reference winding. When the goniometer rotor is positioned by the servo motor so that no rotor voltage is developed, no 100-cps modulation occurs, no voltage is developed for the servo motor control winding, and the servo motor rotor does not rotate. Since the pointer of the goniometer-indicator is attached to the goniometer rotor through the compensation mechanism, the pointer indicates the compensated bearing of the station being received.

The compensation mechanism is used to adjust the bearing indication when the received signal is distorted by the airframe. The compensation mechanism provides a plus or minus 25° adjustment of the indication every 30° starting at 15°. Additional adjustment is available at 0° and 180°.

Communication and Radio Range Operation. With the function switch in the ANT position, the balanced modulator is de-energized and the receiver functions as a communication and low-frequency radio range receiver. The r-f voltage induced in the sense antenna is amplified and detected, and the audio output is fed to the headset.

SECTION II

INSTALLATION

2-1. UNPACKING.

Carefully remove the equipment from the packing case. Inspect each unit for damage. Be sure the operating controls on the receiver and the variation knob on the goniometer-indicator function properly. Check the units and accessories against the packing slip to be sure all items have been removed from the packing case.

2-2. INSTALLATION CONSIDERATIONS.

The location and installation of the units will depend on the type of aircraft in which the equipment is to be installed; however, the following requirements are applicable to all types of aircraft.

Unit Dimensions and Installation Area. Installation and outline dimensions are shown in Figures 2-1 through 2-9 and 2-11. Compare the space requirements of each unit with the area being considered. Locate the units so that they are accessible for inspection and maintenance and in an area free from excessive vibration and heat.

Location of Receiver and Dynaverter. Install the receiver within convenient view and reach of the operator. The Dynaverter may be installed in any convenient location. Allow sufficient clearance on all sides of each unit for shock-travel and ventilation, and sufficient space in front of each unit to permit easy removal from its mounting. Allow sufficient space for cable and external wiring connections to be made, and arrange the cable and wiring so as not to restrict shock-mount travel.

Location of Goniometer-Indicator. The goniometer-indicator should be installed on a shock-mounted instrument panel within convenient view and reach of the operator. Allow at least 2-1/2 inches of open space at the rear of the unit for installing the connector. Because the length of the interconnecting cable is critical and cannot be altered, the distance between the goniometer-indicator and the receiver must not exceed the cable length of 4 feet.

Location of Loop Antenna. The loop antenna may be mounted on either the top or bottom of the aircraft, but should be located as near as possible to the centerline of the aircraft. The loop antenna should be kept away from other antennas and structural members which may cause distortion of the radio field pattern. Because the length of the loop cable is critical and cannot be altered, the distance between the loop antenna and the goniometer-indicator must not exceed the cable length of 20 feet.

Characteristics of Sense Antenna. It is difficult to obtain optimum antenna arrangements on any but the largest aircraft; even then certain compromises are to be expected. An ADF usually performs satisfactorily using a "standard" range antenna. A satisfactory type of wire antenna is the balanced- or symmetrical-T, although an inverted-L or unbalanced-T may also provide acceptable results. The balanced-T antenna is not responsive to horizontally polarized transmissions and is therefore preferred to the inverted-L. (Response to horizontal radiation is undesirable where accurate indications of over-station position are required.) The sense antenna may be mounted on either the top or bottom of the aircraft, but should be located as near the centerline as possible. The flat-top portion of the antenna should not be less than 8 feet in length. A length up to 12 feet may give increased performance. A longer sense antenna will provide better communication receiver sensitivity, but may result in sluggish ADF operation. The average clearance between the antenna and the skin of the aircraft should be 10 inches or more. The sense antenna kit includes all of the parts necessary for constructing and installing a sense antenna.

Depending on the location of the sense antenna, the feed-through insulator for the sense antenna should be mounted on either the top or bottom of the aircraft, as near as possible to the midpoint of the aircraft.

The sense antenna cable is supplied in either a 7- or 14-foot length. (Where extremely short runs are encountered, it may be more convenient to fabricate a 3-1/2-foot section of RG-58/U cable locally, although no performance advantage would result.) Each of the sense antenna cables has a capacitance of 100 pf. To maintain proper antenna tuning, the lengths of these cables must not be altered. The 7-foot cable is preferred because of its lighter weight, flexibility, and ruggedness.

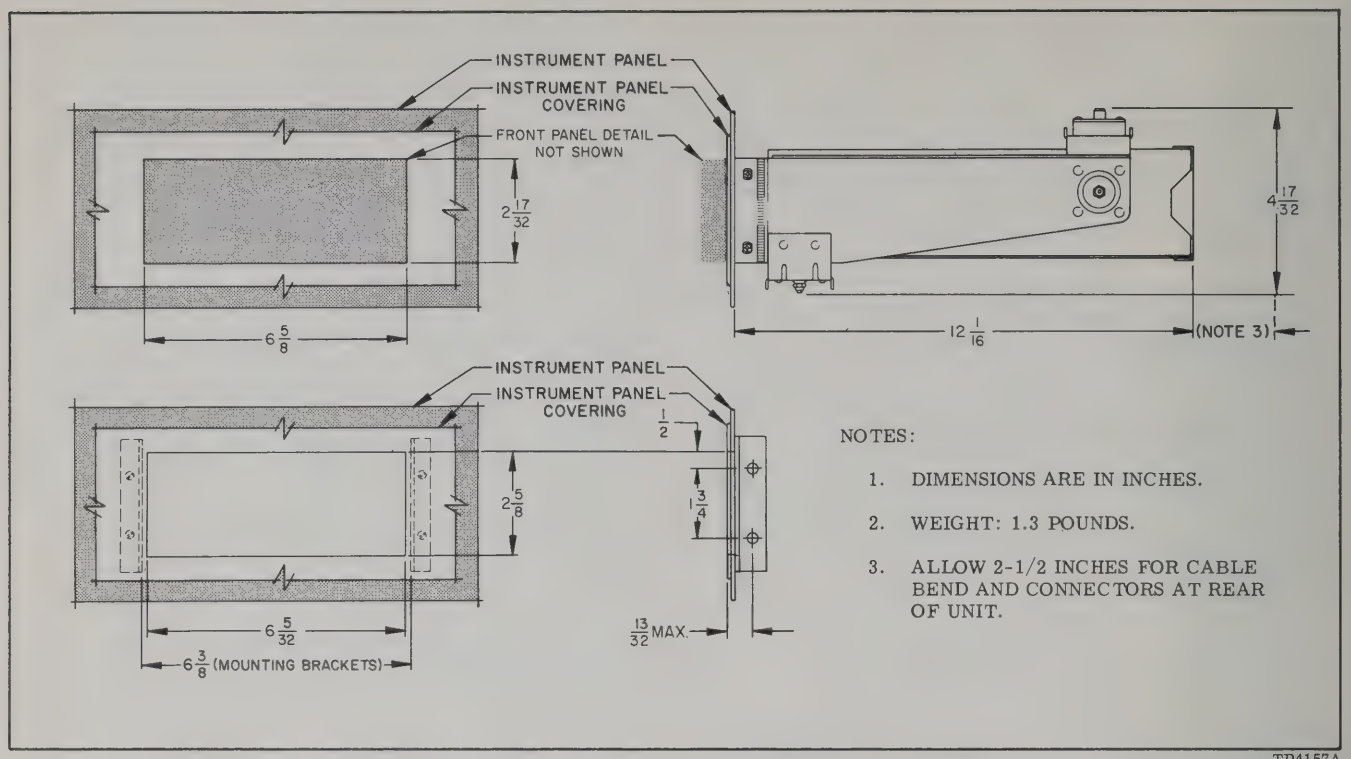

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Figure 2-1. M-301G Mounting, Installation Diagram

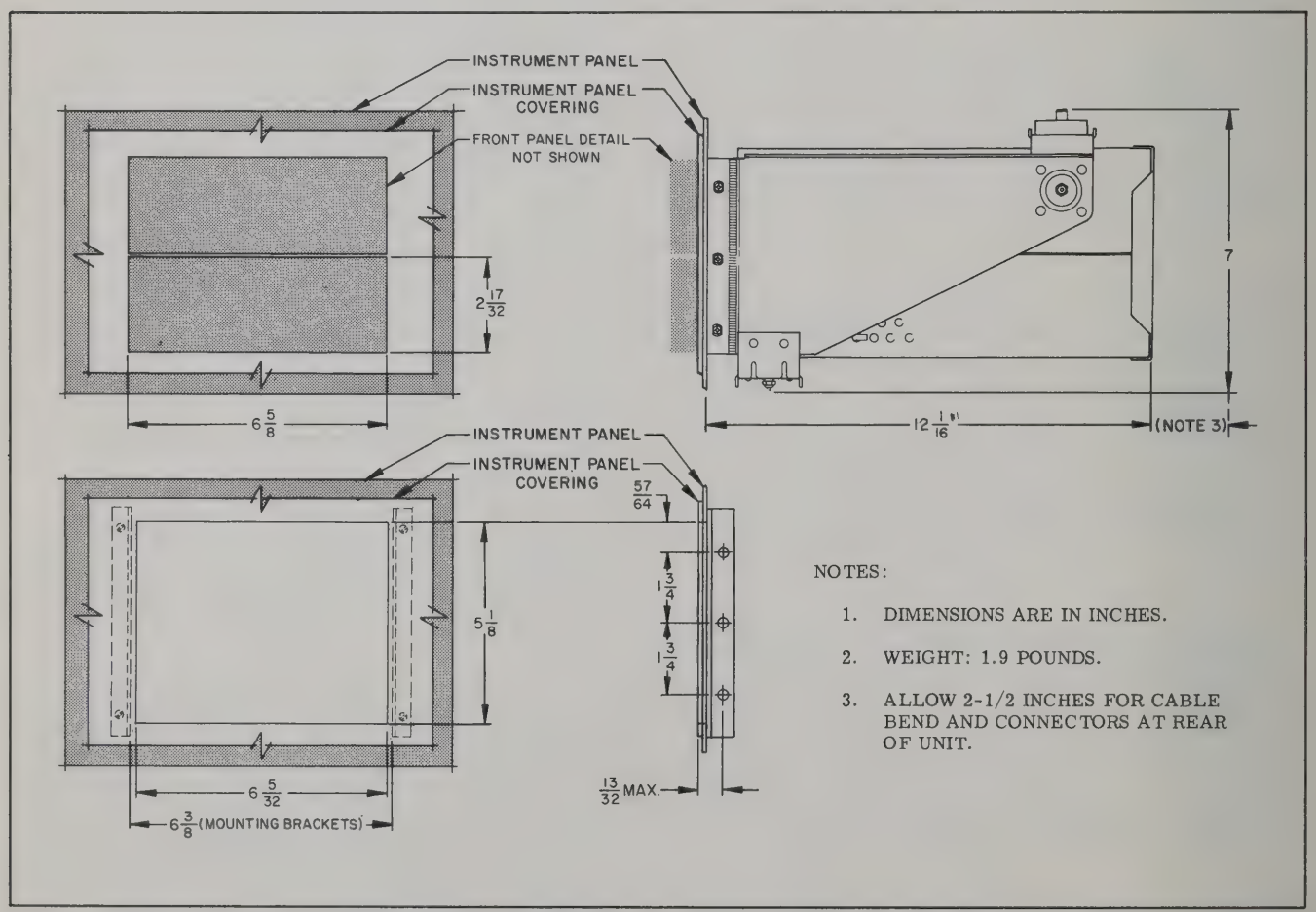

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Figure 2-2. M-302G Mounting, Installation Diagram

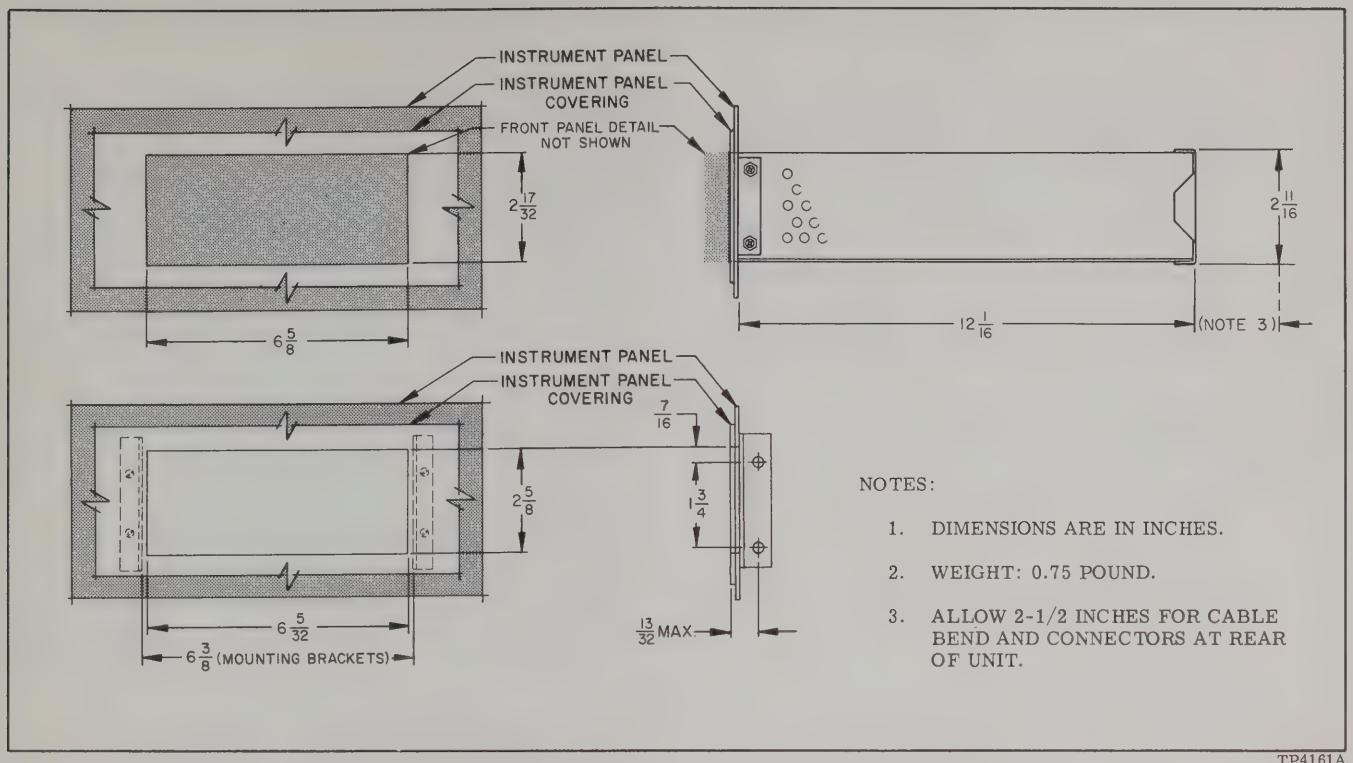

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Figure 2-3. M-303G Mounting, Installation Diagram

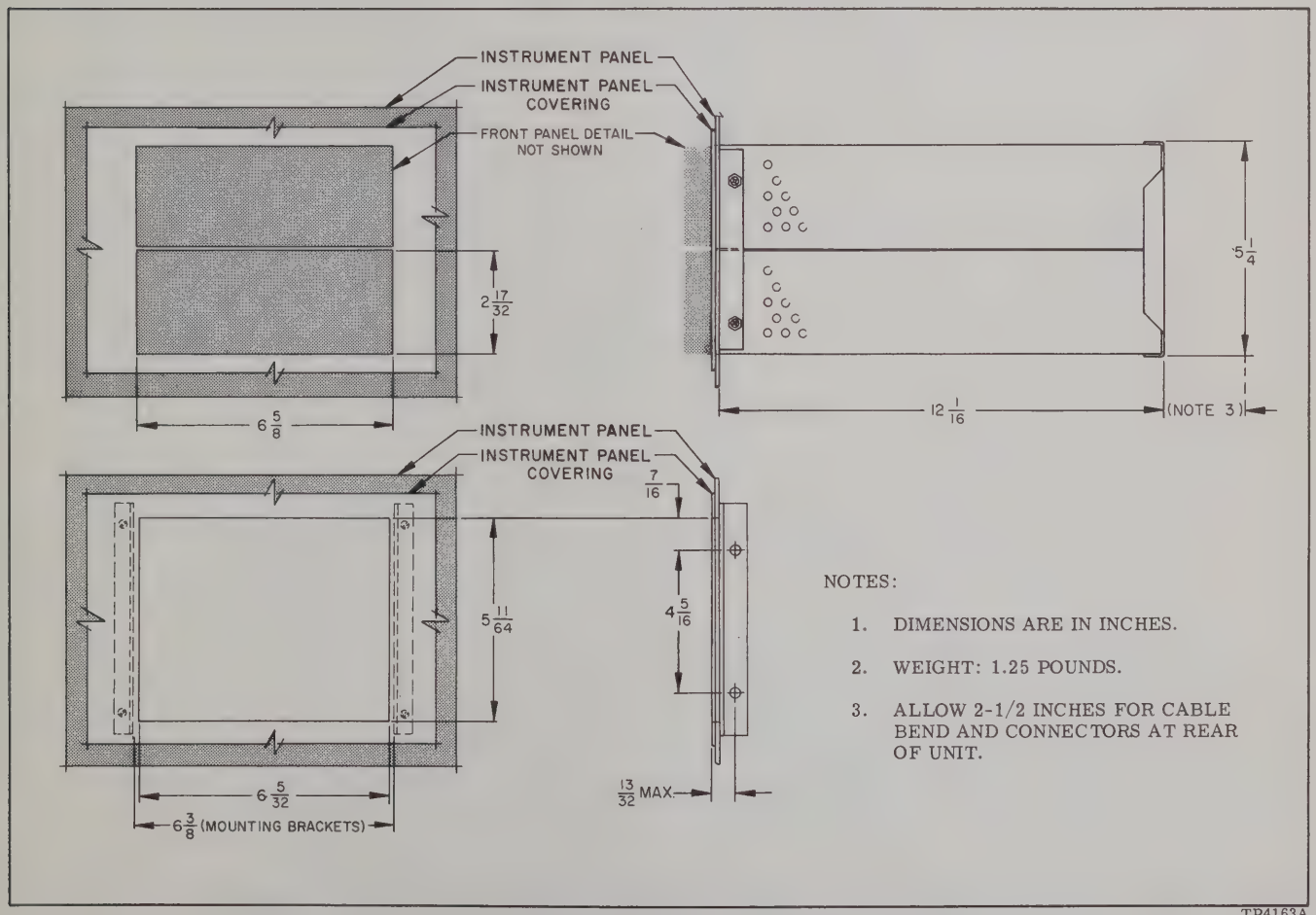

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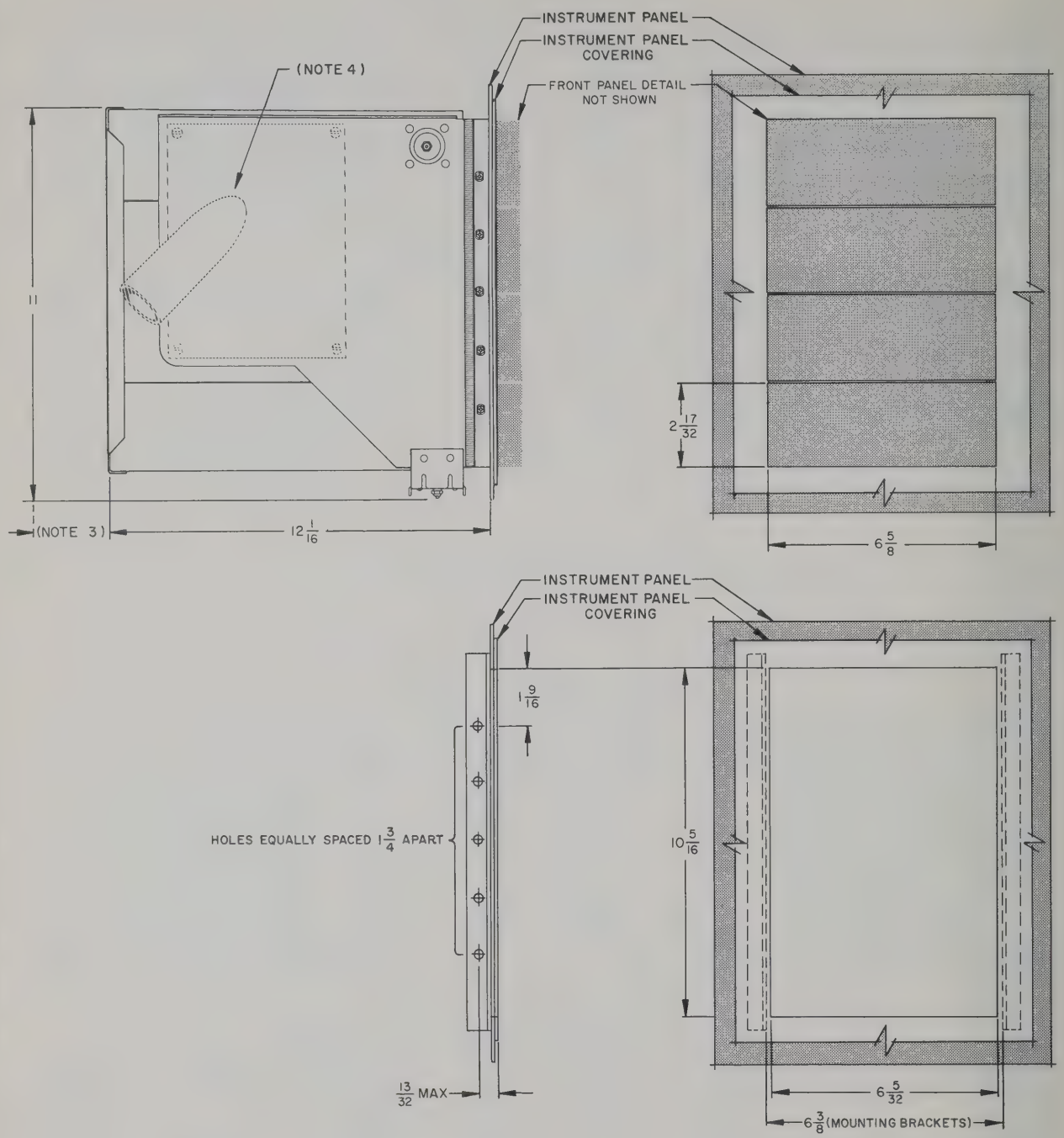
Figure 2-4. M-304G Mounting, Installation Diagram



NOTES:

1. DIMENSIONS ARE IN INCHES.
2. WEIGHT: M-306G: 4.0 POUNDS;
   M-306H: 3.75 POUNDS.
3. ALLOW 2-1/2 INCHES FOR CABLE BEND AND CONNECTORS AT REAR OF UNITS.
4. PLENUM CHAMBER USED ON M-306G ONLY.

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Figure 2-5. M-306G or M-306H Mounting, Installation Diagram

2-3. INSTALLATION OF RECEIVER AND MOUNTING.

Install the receiver and required mounting as follows:

Step 1. If a knockout panel of suitable size and mounting flanges are not provided on aircraft instrument panel, cut required opening in panel. Fabricate two mounting brackets, as shown in Figure 2-1, 2-2, 2-3, 2-4, or 2-5. Both sides of flanges or brackets should be clean, bare metal for proper grounding.

Step 2. Drill and countersink holes in flanges or brackets, as shown in applicable installation diagram.

Step 3. Position mounting behind instrument panel and fasten mounting to flanges or brackets. Note that for M-301G, M-302G, M-306G, and M-306H, flanges or brackets are on inside of mounting, while for the M-303G and M-304G, they are on outside of mounting.

Note

If the optional BFO kit is to be installed, complete the procedure of paragraph 2-10 before continuing with this procedure.

Step 4. Slide receiver into mounting. Secure it in place by rotating recessed locking screw near lower edge of front panel.

Step 5. If M-306G Mounting is used, connect plenum chamber on mounting through 1-1/2-inch I.D. rubber tube to ram air source. Output of ram air source should be at least 7.5 cubic feet per minute.

2-4. INSTALLATION OF GONIOMETER-INDICATOR.

Installation dimensions for IN-21B and IN-21C Goniometer-Indicators are shown in Figure 2-6. Before installing either unit, check that the internal wiring is correct for the loop and sense antenna installation locations.

Note

The goniometer-indicator must be installed within 4 feet of the receiver.

If a remote bearing or RMI indicator is to be used, the following conditions should be considered when installing a goniometer-indicator.

a. An IN-21B Goniometer-Indicator is required.

b. The synchro transmitter in the IN-21B and

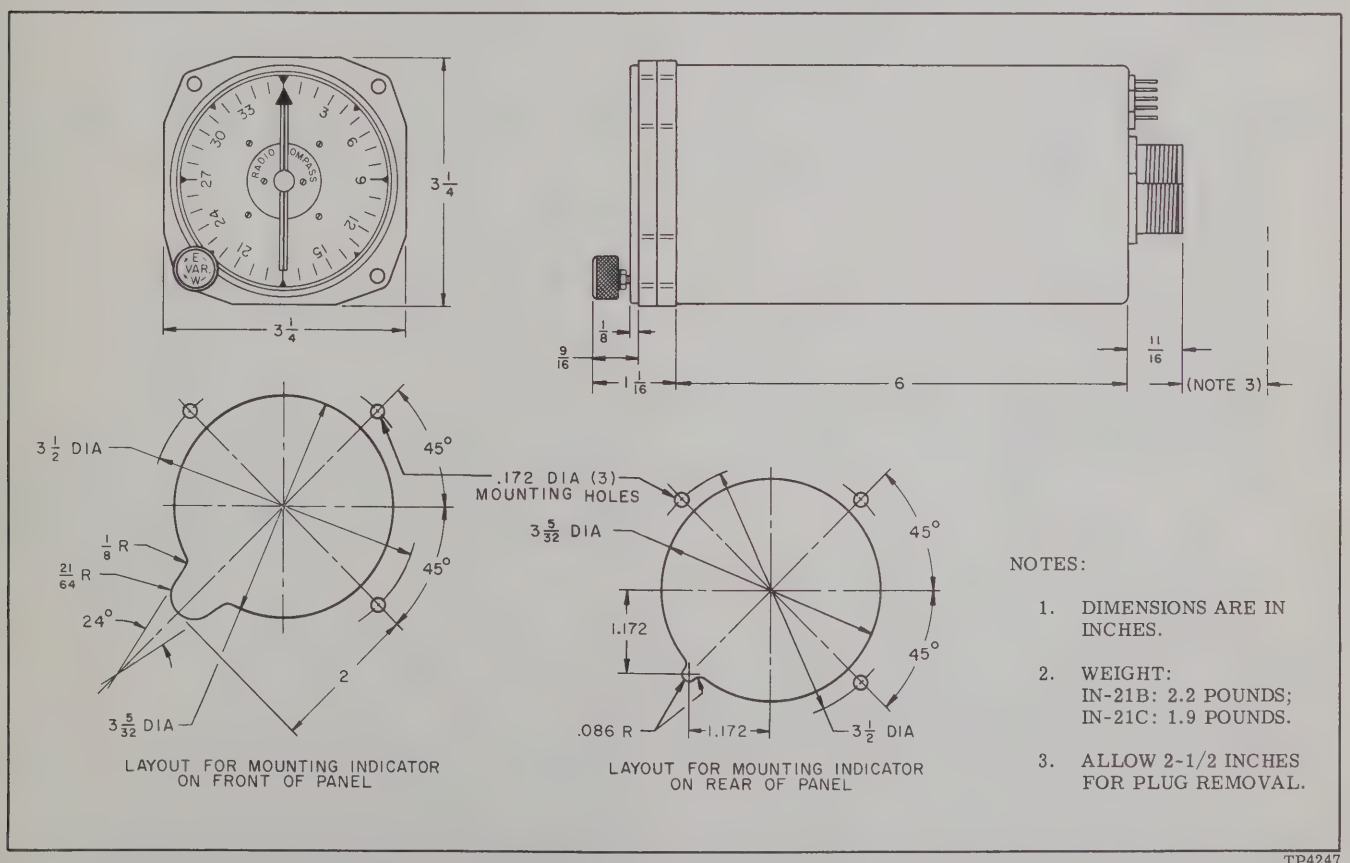
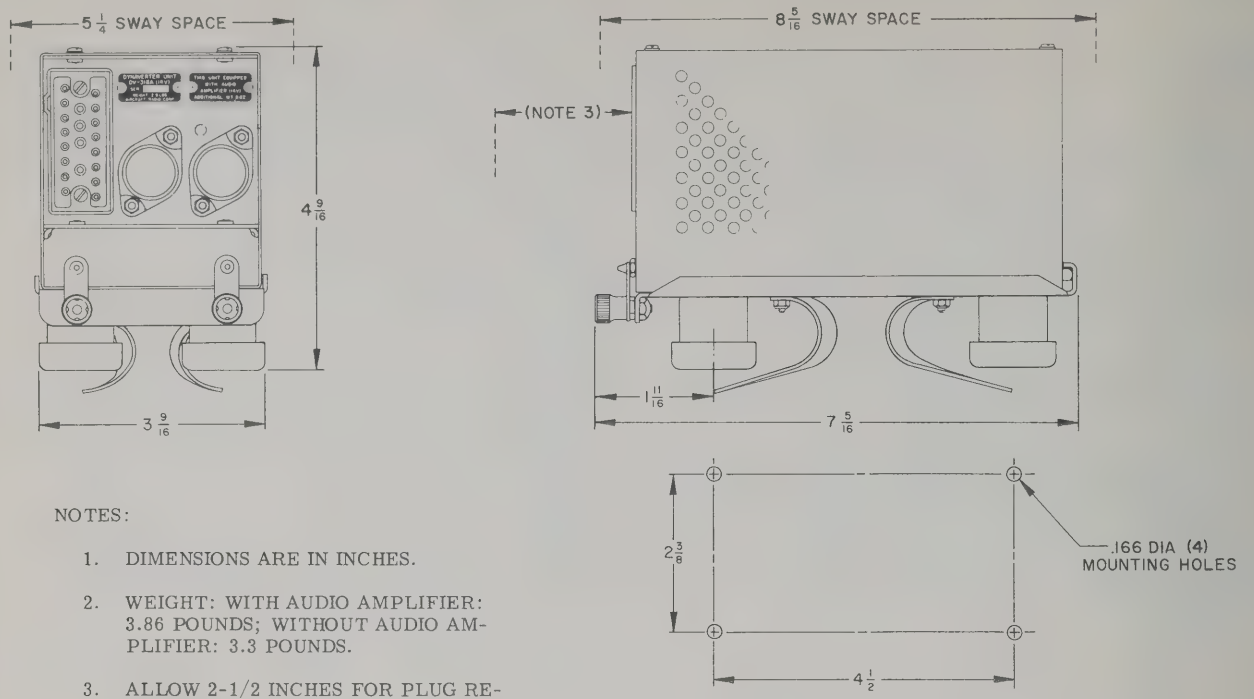


Figure 2-6. IN-21B or IN-21C Goniometer-Indicator, Installation Dimensions



NOTES:

1. DIMENSIONS ARE IN INCHES.
2. WEIGHT: WITH AUDIO AMPLIFIER: 3.86 POUNDS; WITHOUT AUDIO AMPLIFIER: 3.3 POUNDS.
3. ALLOW 2-1/2 INCHES FOR PLUG REMOVAL.

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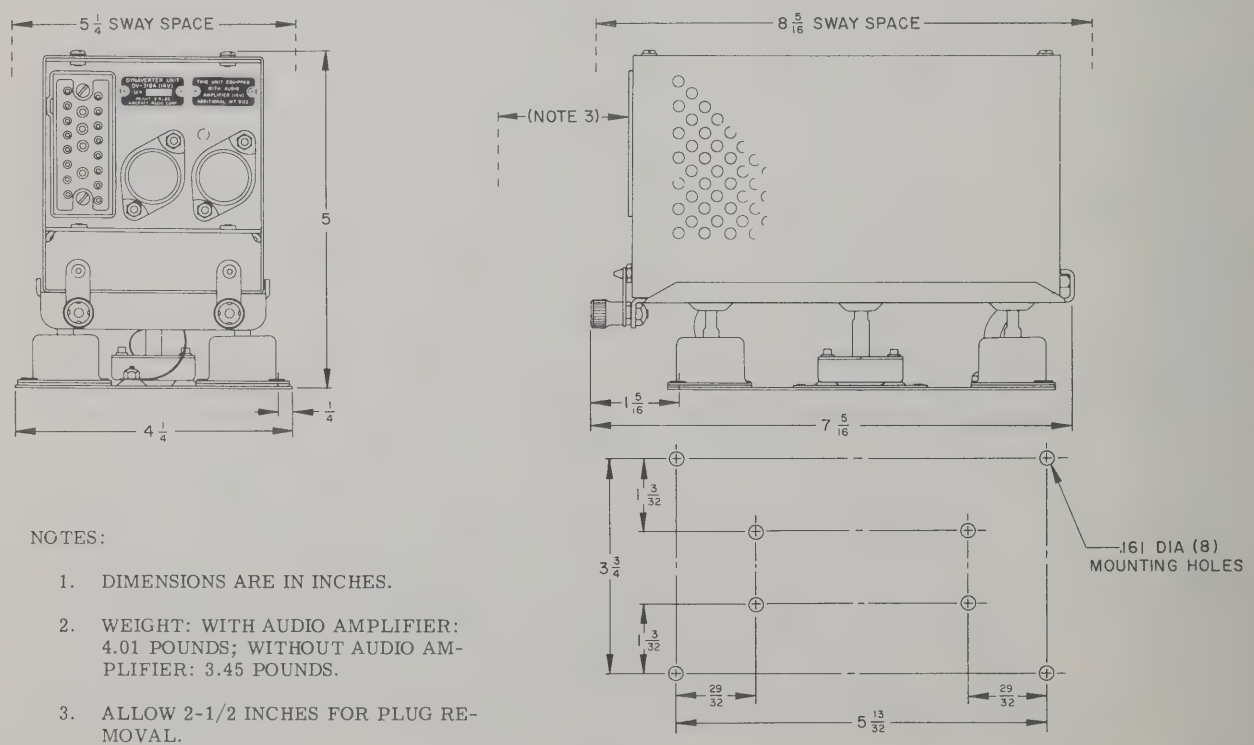
Figure 2-7. DV-318A Dynaverter with M-28 Mounting, Installation Dimensions



NOTES:

1. DIMENSIONS ARE IN INCHES.
2. WEIGHT: WITH AUDIO AMPLIFIER: 4.01 POUNDS; WITHOUT AUDIO AMPLIFIER: 3.45 POUNDS.
3. ALLOW 2-1/2 INCHES FOR PLUG REMOVAL.

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Figure 2-8. DV-318A Dynaverter with M-28A Mounting, Installation Dimensions

the synchro receiver in the remote indicator must be excited by an a-c power source for which they are designed.

c. The IN-12-1, IN-13A-1, and IN-16A indicators function properly using the 13 volts, 100 cps supplied by the Dynaverter of the 318G ADF Set or using an externally generated 26-volt, 400-cps supply.

d. Military indicators, such as the ID-250, require a 26-volt, 400-cps power source for proper operation.

2-5. INSTALLATION OF DYNAVERTER AND MOUNTING.

Installation dimensions for the Dynaverter, installed on its mounting, are shown in Figures 2-7 and 2-8. To install the Dynaverter and its mounting, proceed as follows:

Step 1. If M-28 is used, drill aircraft mounting surface for four No. 8 screws as shown in Figure 2-7; if M-28A is used, eight holes for No. 6 screws are required as shown in Figure 2-8.

Note

Bottom plate of mounting may be used as a template for locating the mounting holes.

Step 2. Using either four No. 8 binding head screws or eight No. 6 binding head screws, secure the mounting in position with lockwashers and nuts.

Note

If optional audio amplifier kit is to be installed in the Dynaverter, complete the procedure outlined in paragraph 2-11 before completing this procedure.

Step 3. Loosen knurled thumbnuts on front of mounting so that links point down. Slide Dynaverter on mounting. Press down near front of Dynaverter, rotate links so that their holes engage conical studs, and tighten thumbnuts.

2-6. INSTALLATION OF SENSE ANTENNA.

The sense antenna may be fabricated from the optional Sense Antenna Kit 19210. General installation requirements are discussed in paragraph 2-2 and are shown in Figure 2-9. The procedure for installing the insulator assembly, which may be ordered as a separate item, is outlined in paragraph 2-7.

2-7. INSTALLATION OF INSULATOR ASSEMBLY.

To install Insulator Assembly 19077, the sense antenna feed-through insulator, as shown in detail C of Figure 2-9, proceed as follows:

Step 1. If necessary, place a doubler at feed-through location to provide a total thickness of at least 0.040 inch.

Step 2. Drill a 3/8-inch hole through doubler and aircraft skin.

Step 3. Mount connector in hole using formed washer and hexagon nut.

Step 4. Slide cap assembly over antenna lead-in. Place lead-in through cross-hole in terminal of connector, and solder so that lead-in is aligned with center of connector.

Step 5. Cut off excess lead-in wire. Screw cap assembly on connector.

2-8. INTERCONNECTION OF UNITS.

The units of the ADF set are supplied ready for installation except for the goniometer-indicator which may require internal rewiring depending on the relative mounting positions (top or bottom) of the loop and sense antennas. R-f cables are supplied to interconnect the loop antenna to the goniometer-indicator, the goniometer-indicator to the receiver, and the receiver to the sense antenna. All other cables are fabricated using individual wires (not supplied) and the connectors listed in Table 1-1. An interconnection diagram is shown in Figure 2-10.

2-9. INSTALLATION OF LOOP ANTENNA.

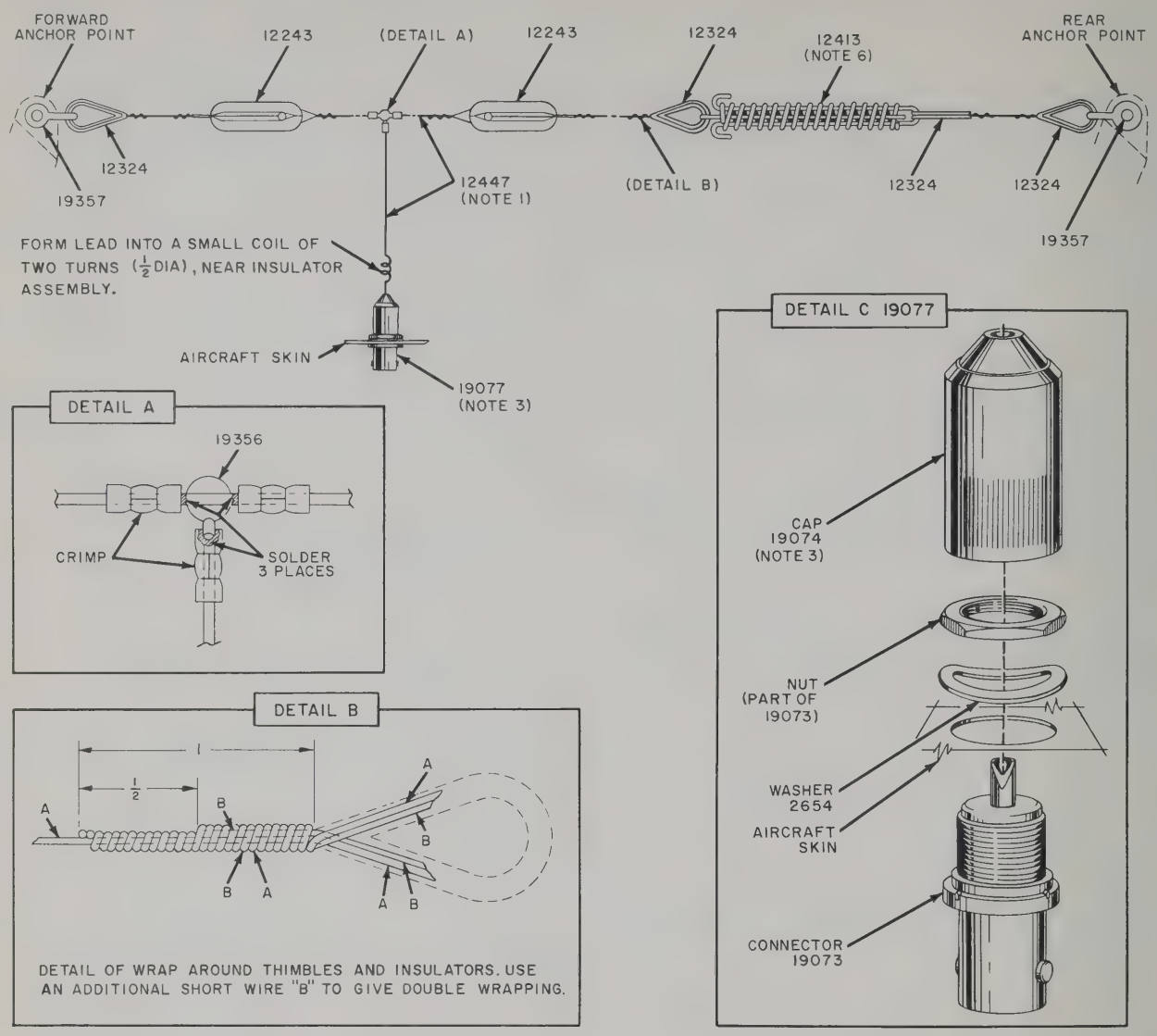
The following installation procedure is required to obtain maximum advantage of the available 7.5° of fixed compensation in the loop antenna. Installation dimensions of the loop antenna, including the doubler plate, are shown in Figure 2-11.

Note

Since the following procedure requires operation of the receiver, read Section III before proceeding.

Step 1. Interconnect all units as shown in Figure 2-10, routing Loop Antenna Cable Assembly 32803 through aircraft door or window opening to permit full movement of loop antenna.

Step 2. With aircraft positioned in an area clear of all objects which may cause distortion or reflection of received signal, turn on receiver and tune to a station having a known magnetic compass



NOTES:

1. NOMINAL LENGTHS OF WIRE ARE FURNISHED WITH KIT. (ADDITIONAL WIRE MAY BE ORDERED SEPARATELY IN BULK.)
2. WIRES ARE NO. 18 AWG SOLID, COPPER-CLAD STEEL.
3. SEE DETAIL "C" FOR INSTALLATION OF INSULATOR ASSEMBLY. SCREW ON CAP AFTER SOLDERING.
4. USE SCREWS AND NUTS FURNISHED TO FASTEN ANTENNA MASTS TO AIRCRAFT.
5. LOCATE VERTICAL SECTION OF ANTENNA AS NEAR THE CENTER OF THE HORIZONTAL SECTION AS POSSIBLE.
6. ADJUST TENSION FOR 3/4-INCH SPRING DEFLECTION; THAT IS, WHEN COMPRESSED, COIL SPRING LENGTH IS 2-5/16 INCHES.

TP1411B

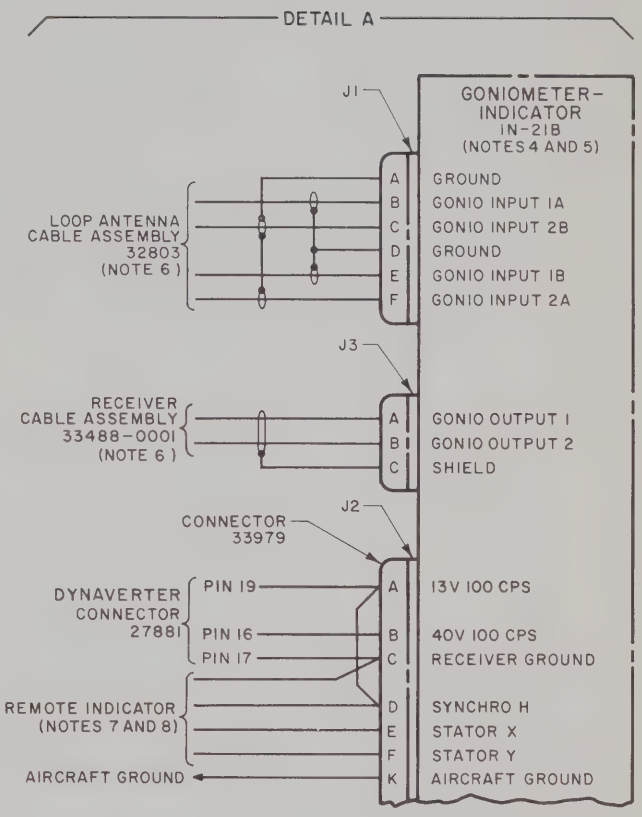
Figure 2-9. Sense Antenna Kit 19210, Installation Diagram

NOTES:

1. FOR PROPER GROUNDING, AIRCRAFT SURFACES TO WHICH MOUNTINGS OR UNITS ARE ATTACHED MUST BE CLEAN, BARE METAL.
2. UNMARKED WIRES ARE NO. 22 AWG INSULATED COPPER. WIRES MARKED WITH ASTERISK (*) ARE NO. 16 AWG INSULATED COPPER.
3. FOR 14-VOLT OPERATION, CONNECT WIRES MARKED •••• AND OMIT WIRES MARKED x x x. FOR 28-VOLT OPERATION, CONNECT WIRES MARKED x x x AND OMIT WIRES MARKED ••••.
4. GONIOMETER-INDICATOR IS INTERNALLY WIRED FOR BOTTOM-MOUNTED LOOP ANTENNA AND TOP-MOUNTED SENSE ANTENNA. IF OTHER LOCATIONS ARE USED, REWIRE TERMINALS AS FOLLOWS:

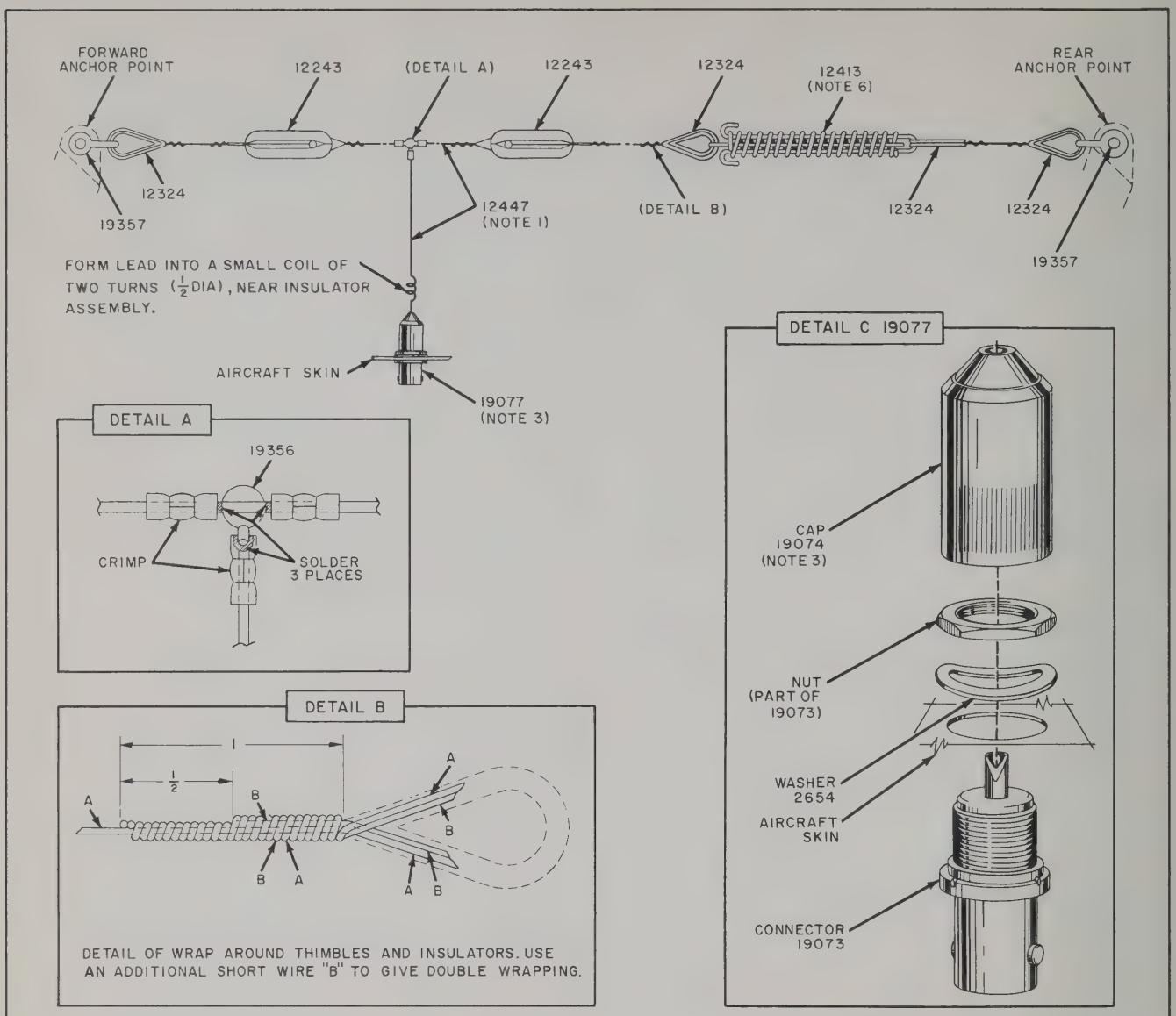
	TOP LOOP		BOTTOM LOOP	
WIRE COLOR	TOP SENSE	BOTTOM SENSE	TOP SENSE	BOTTOM SENSE
RED	6	5	5	6
BLACK	5	6	6	5
GREEN	1	1	2	2
WHITE	2	2	1	1

5. IN-21C IS NORMALLY SUPPLIED. IF REMOTE INDICATOR IS DESIRED, USE IN-21B. SEE DETAIL "A."
6. LENGTH OF CABLE ASSEMBLY IS CRITICAL: DO NOT ALTER.
7. FOR EXTERNAL EXCITATION OF REMOTE INDICATOR, REMOVE JUMPER WIRE BETWEEN TERMINALS A AND D AND CONNECT TERMINAL D TO 26-VOLT, 400-CPS SOURCE.
8. TO WIRE FOR REMOTE INDICATOR, CONNECT SYNCHRO H TO INDICATOR SYNCHRO H, STATOR X TO INDICATOR STATOR Y, STATOR Y TO INDICATOR STATOR X, AND RECEIVER GROUND TO INDICATOR GROUND.
9. IF OPTIONAL AUDIO AMPLIFIER KIT IS NOT USED, CONNECT TERMINAL 5 OF CONNECTOR 26795 TO AIRCRAFT AUDIO SYSTEM.



TP4253

Figure 2-10. 318G Automatic Direction Finder, Interconnection Diagram



NOTES:

1. NOMINAL LENGTHS OF WIRE ARE FURNISHED WITH KIT. (ADDITIONAL WIRE MAY BE ORDERED SEPARATELY IN BULK.)
2. WIRES ARE NO. 18 AWG SOLID, COPPER-CLAD STEEL.
3. SEE DETAIL "C" FOR INSTALLATION OF INSULATOR ASSEMBLY. SCREW ON CAP AFTER SOLDERING.
4. USE SCREWS AND NUTS FURNISHED TO FASTEN ANTENNA MASTS TO AIRCRAFT.
5. LOCATE VERTICAL SECTION OF ANTENNA AS NEAR THE CENTER OF THE HORIZONTAL SECTION AS POSSIBLE.
6. ADJUST TENSION FOR 3/4-INCH SPRING DEFLECTION; THAT IS, WHEN COMPRESSED, COIL SPRING LENGTH IS 2-5/16 INCHES.

TP1411B

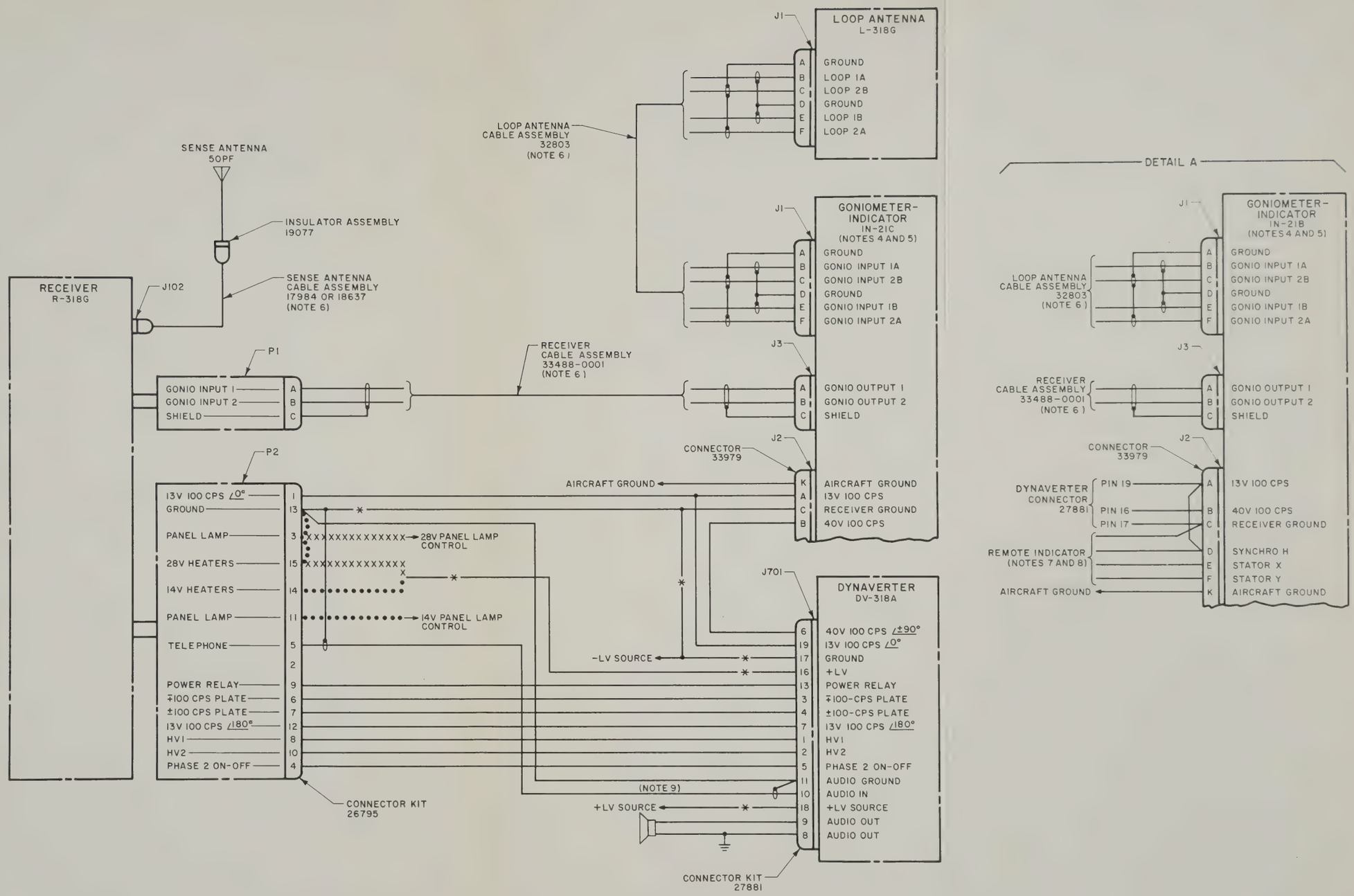
Figure 2-9. Sense Antenna Kit 19210, Installation Diagram

NOTES:

1. FOR PROPER GROUNDING, AIRCRAFT SURFACES TO WHICH MOUNTINGS OR UNITS ARE ATTACHED MUST BE CLEAN, BARE METAL.
2. UNMARKED WIRES ARE NO. 22 AWG INSULATED COPPER. WIRES MARKED WITH ASTERISK (*) ARE NO. 16 AWG INSULATED COPPER.
3. FOR 14-VOLT OPERATION, CONNECT WIRES MARKED ●●●● AND OMIT WIRES MARKED X X X. FOR 28-VOLT OPERATION, CONNECT WIRES MARKED X X X AND OMIT WIRES MARKED ●●●●.
4. GONIOMETER-INDICATOR IS INTERNALLY WIRED FOR BOTTOM-MOUNTED LOOP ANTENNA AND TOP-MOUNTED SENSE ANTENNA. IF OTHER LOCATIONS ARE USED, REWIRE TERMINALS AS FOLLOWS:

WIRE COLOR	TOP LOOP		BOTTOM LOOP	
	TOP SENSE	BOTTOM SENSE	TOP SENSE	BOTTOM SENSE
RED	6	5	5	6
BLACK	5	6	6	5
GREEN	1	1	2	2
WHITE	2	2	1	1

5. IN-21C IS NORMALLY SUPPLIED. IF REMOTE INDICATOR IS DESIRED, USE IN-21B. SEE DETAIL "A."
6. LENGTH OF CABLE ASSEMBLY IS CRITICAL: DO NOT ALTER.
7. FOR EXTERNAL EXCITATION OF REMOTE INDICATOR, REMOVE JUMPER WIRE BETWEEN TERMINALS A AND D AND CONNECT TERMINAL D TO 26-VOLT, 400-CPS SOURCE.
8. TO WIRE FOR REMOTE INDICATOR, CONNECT SYNCHRO H TO INDICATOR SYNCHRO H, STATOR X TO INDICATOR STATOR Y, STATOR Y TO INDICATOR STATOR X, AND RECEIVER GROUND TO INDICATOR GROUND.
9. IF OPTIONAL AUDIO AMPLIFIER KIT IS NOT USED, CONNECT TERMINAL 5 OF CONNECTOR 26795 TO AIRCRAFT AUDIO SYSTEM.



TP4253

Figure 2-10. 318G Automatic Direction Finder, Interconnection Diagram

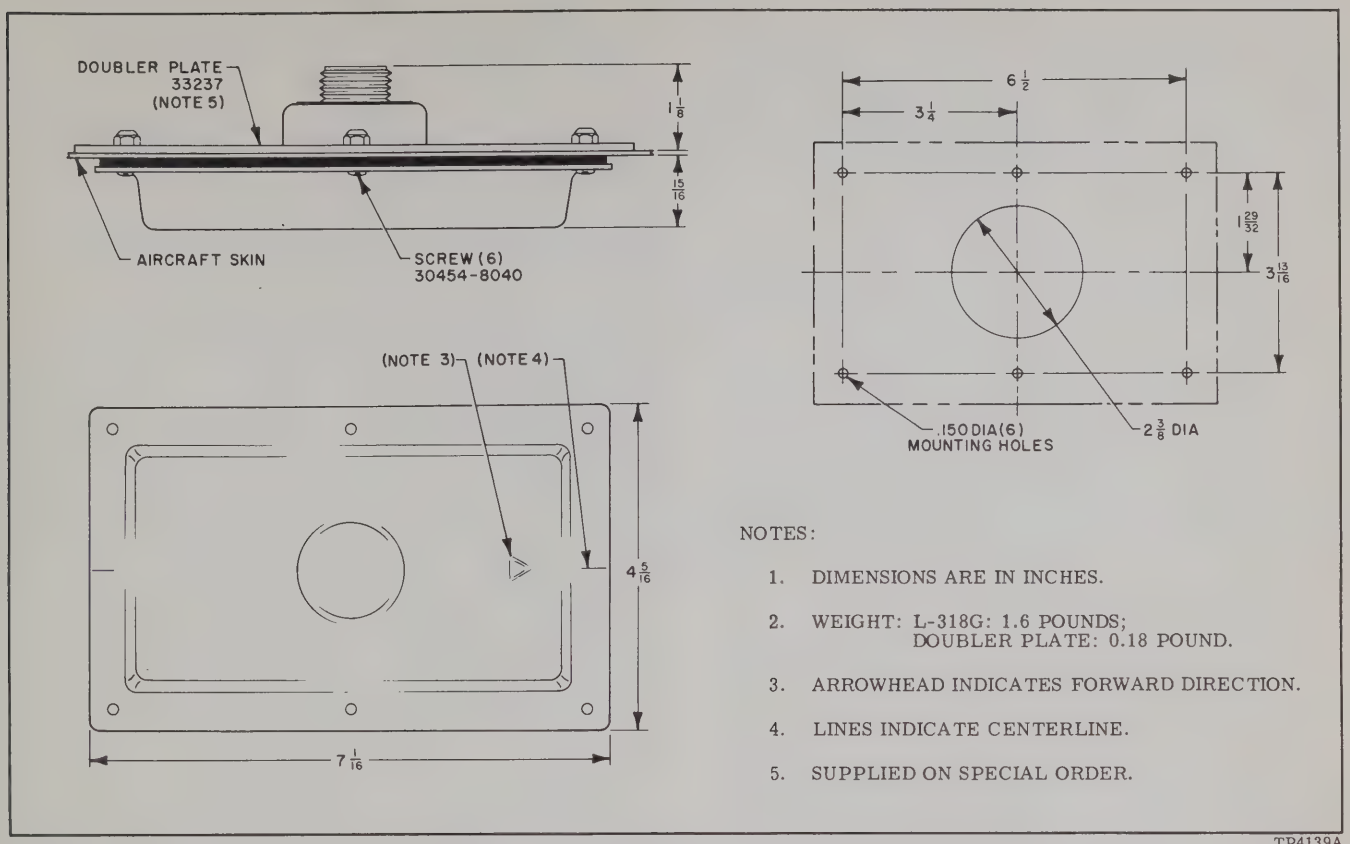


Figure 2-11. L-318G Loop Antenna, Installation Dimensions

bearing. Align 0° of dial at index of goniometer-indicator.

Note

Station selected should be at least 60 miles distant, static-clear, and operating below 500 kc.

Step 3. Using a magnetic compass, align centerline of aircraft with known station bearing. Cage DG (directional gyro), adjust to 0°, and uncage.

Step 4. Using DG, turn aircraft to a heading of 315°.

Step 5. Position loop antenna on centerline of aircraft with impressed arrowhead of loop antenna pointing forward. Centerline of loop antenna is indicated by index marker on fore and aft edges. Move loop antenna forward and backward along centerline of aircraft until goniometer-indicator indicates, as closely as possible, 45°. Make certain centerlines of loop antenna and aircraft are aligned. Tape loop antenna to aircraft.

Note

To facilitate the installation of the loop antenna, four stand-off posts (33441) are available as optional items. Posts mount at corners of loop antenna to provide clearance for loop cable and connector. Also, pointed ends will aid in locating centers of mounting holes.

Step 6. Using DG, turn aircraft to a heading of 0° and check that goniometer-indicator indicates 0 ±5°.

Step 7. If error is greater than ±5°, rotate loop antenna slightly until error is within limits.

Step 8. Mark final position of loop antenna, remove loop antenna, and drill mounting holes in aircraft skin as shown in Figure 2-11.

Step 9. Using six No. 6-32, corrosion-resistant, binding head screws, 5/8 inch long, secure loop antenna in position.

Note

A doubler plate, such as 33237 (optional), should be used to install the loop antenna. After the required mounting holes for the loop antenna have been drilled, install the doubler plate by riveting or bolting the doubler plate to the inside surface of the aircraft skin. Securing the doubler plate to the aircraft skin permits easy removal and reinstallation of the loop antenna.

Step 10. Reroute loop cable assembly inside aircraft and connect to loop antenna.

2-10. INSTALLATION OF BFO KIT.

General. BFO Kit 33838 is optional and is supplied on special order. The kit contains all the parts necessary to fabricate and install a BFO on the receiver. Installation dimensions and wiring information for the kit are shown in Figure 2-12.

Procedure.

Step 1. Remove nameplate from rear of receiver chassis.

Step 2. Solder wires to terminals of BFO assembly (20639) as shown in Figure 2-12.

Step 3. Mount BFO assembly using two posts (27947), screws (144-0016 and 504-0016), and lockwashers (8497). Use flat head screw in hole that will be located beneath nameplate.

Step 4. Replace nameplate.

Step 5. Detach function switch from receiver front panel and unsolder wires connected to switch terminals.

Step 6. Connect a jumper wire between terminals 1 and 12 and another between terminals 2 and 3 of switch (27948) supplied with BFO kit.

Step 7. Solder wires previously removed from old switch terminals to terminals of new switch as shown in Figure 2-12.

Step 8. Attach switch (27948), printed plate (33825), and knob (33615-0001) to front panel.

Step 9. Solder two resistors (201-0333 and 201-0104) and two capacitors (21485-9101 and 8791-9101) to main printed-circuit board as shown.

Step 10. Interconnect BFO assembly, switch, two resistors, and two capacitors. Route interconnecting wires along longitudinal partition of receiver, following general path of other interconnecting wires.

Step 11. Attach lead from terminal 4 of Z108 to main printed-circuit board as shown.

2-11. INSTALLATION OF AUDIO AMPLIFIER KIT.

Audio Amplifier Kit 27624-0014 or 27624-0028 is optional and is supplied with the Dynaverter on special order. The kit contains all the parts necessary to install the audio amplifier and wire it into the circuit. Installation and wiring information for the kit are shown in Figure 2-13. To install the kit, proceed as follows:

Step 1. Remove two screws (504-0016) that secure T706 to mounting posts of audio amplifier.

Step 2. Mount audio amplifier and fasten in place with two screws removed in Step 1 and screw (503-0016) supplied.

Step 3. Solder audio amplifier leads to terminals of J701 as shown in Figure 2-13.

Step 4. Using two screws (8956-2010) supplied, attach information plate (27930) to front panel.

2-12. LOOP COMPENSATION PROCEDURES.

Introduction. Due to the distortion of the radio field pattern caused by structural and electrical parts of the aircraft, the apparent direction of arrival of the radio signal must be checked every 15° with respect to the fore-and-aft axis of the aircraft. Provision is made to compensate for bearing errors produced by r-f field distortions, providing the errors do not exceed ±25°. A mechanical compensation device containing compensating screws is located in the rear of the goniometer-indicator as shown in Figure 2-14. When the adjustment screws are in their mid-positions, there is 0° compensation. Goniometer-indicators are supplied with 0° compensation set in.

To obtain accurate results, the loop antenna should be compensated twice; first after gathering data on the ground, and then after gathering data in flight. The data, whether gathered on the ground or during flight, is used to prepare a compensation curve.

General Considerations. Do not gather data during the period starting two hours before sunset and ending two hours after sunrise. Select a station that is static-clear and operating below 500 kc.

Obtaining Ground Data for Loop Compensation. To obtain ground data for loop compensation, proceed as follows:

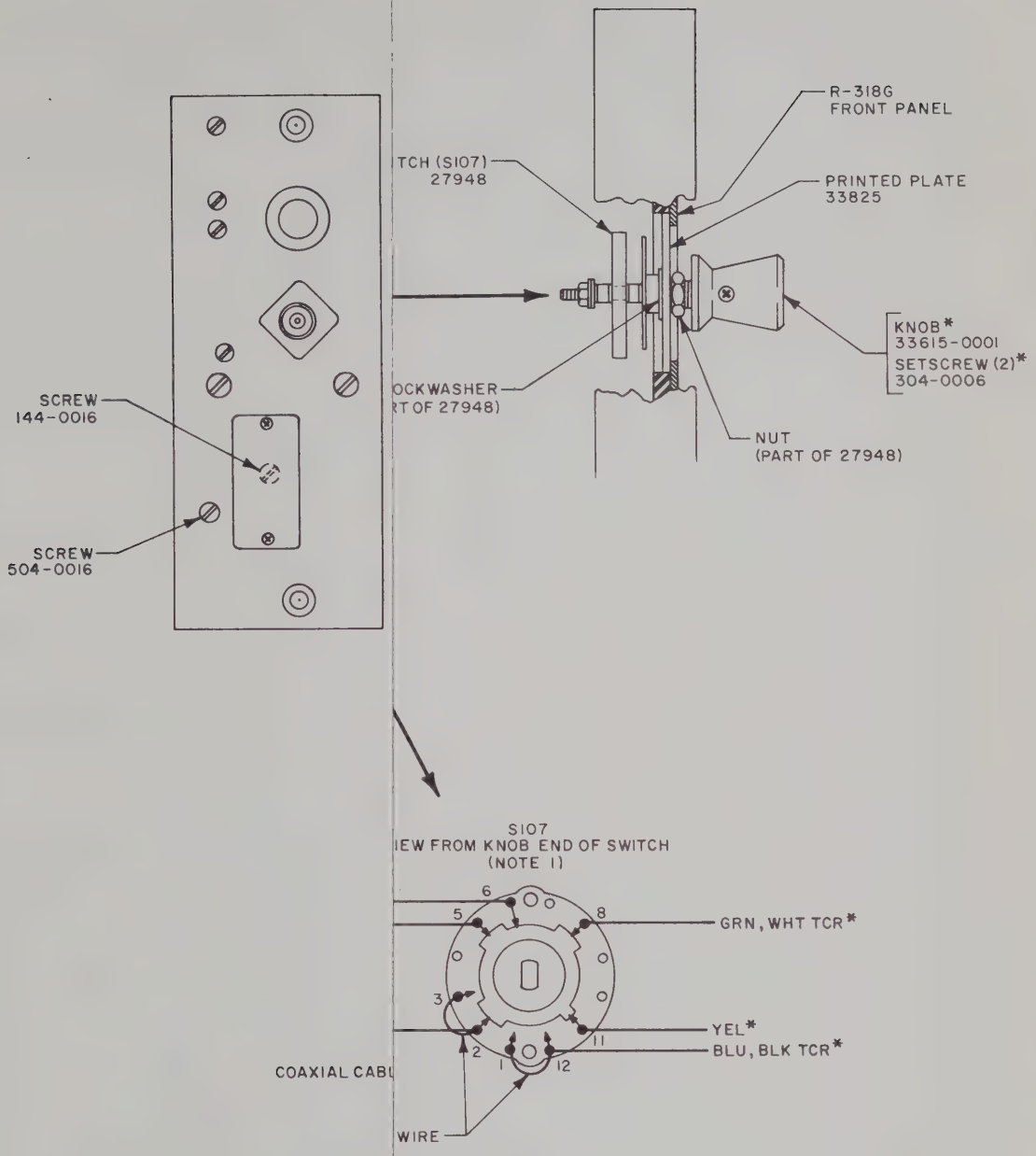
Step 1. Position aircraft in an area clear of all objects which may cause distortions or reflections of received signal.

Step 2. Select a station having a known magnetic compass bearing. Using a compass or transit, align centerline of aircraft with magnetic bearing of station. Align 0° of dial at index on goniometer-indicator.

Step 3. If DG is not slaved, set it to 0°. If DG is slaved, determine heading required to produce desired relative bearings.

Step 4. Turn aircraft clockwise through 360°, recording goniometer-indicator bearing indications every 15° on a form similar to that shown in Figure 2-15 (a completed form is shown in Figure 2-19).

Step 5. Repeat Step 4, turning aircraft counterclockwise through 360°.



NOTES:

1. WIRES MARKED WITH COLOR NO
FUNCTION SWITCH.

2. PARTS MARKED WITH ASTERISK

TP4255

Figure 2-12. BFO Kit 33838, Installation and Interconnection Diagram

2-10. INSTALLATION OF BFO KIT.

General. BFO Kit 33838 is optional and is supplied on special order. The kit contains all the parts necessary to fabricate and install a BFO on the receiver. Installation dimensions and wiring information for the kit are shown in Figure 2-12.

Procedure.

Step 1. Remove nameplate from rear of receiver chassis.

Step 2. Solder wires to terminals of BFO assembly (20639) as shown in Figure 2-12.

Step 3. Mount BFO assembly using two posts (27947), screws (144-0016 and 504-0016), and lockwashers (8497). Use flat head screw in hole that will be located beneath nameplate.

Step 4. Replace nameplate.

Step 5. Detach function switch from receiver front panel and unsolder wires connected to switch terminals.

Step 6. Connect a jumper wire between terminals 1 and 12 and another between terminals 2 and 3 of switch (27948) supplied with BFO kit.

Step 7. Solder wires previously removed from old switch terminals to terminals of new switch as shown in Figure 2-12.

Step 8. Attach switch (27948), printed plate (33825), and knob (33615-0001) to front panel.

Step 9. Solder two resistors (201-0333 and 201-0104) and two capacitors (21485-9101 and 8791-9101) to main printed-circuit board as shown.

Step 10. Interconnect BFO assembly, switch, two resistors, and two capacitors. Route interconnecting wires along longitudinal partition of receiver, following general path of other interconnecting wires.

Step 11. Attach lead from terminal 4 of Z108 to main printed-circuit board as shown.

2-11. INSTALLATION OF AUDIO AMPLIFIER KIT.

Audio Amplifier Kit 27624-0014 or 27624-0028 is optional and is supplied with the Dynaverter on special order. The kit contains all the parts necessary to install the audio amplifier and wire it into the circuit. Installation and wiring information for the kit are shown in Figure 2-13. To install the kit, proceed as follows:

Step 1. Remove two screws (504-0016) that secure T706 to mounting posts of audio amplifier.

Step 2. Mount audio amplifier and fasten in place with two screws removed in Step 1 and screw (503-0016) supplied.

Step 3. Solder audio amplifier leads to terminals of J701 as shown in Figure 2-13.

Step 4. Using two screws (8956-2010) supplied, attach information plate (27930) to front panel.

2-12. LOOP COMPENSATION PROCEDURES.

Introduction. Due to the distortion of the radio field pattern caused by structural and electrical parts of the aircraft, the apparent direction of arrival of the radio signal must be checked every 15° with respect to the fore-and-aft axis of the aircraft. Provision is made to compensate for bearing errors produced by r-f field distortions, providing the errors do not exceed ±25°. A mechanical compensation device containing compensating screws is located in the rear of the goniometer-indicator as shown in Figure 2-14. When the adjustment screws are in their mid-positions, there is 0° compensation. Goniometer-indicators are supplied with 0° compensation set in.

To obtain accurate results, the loop antenna should be compensated twice; first after gathering data on the ground, and then after gathering data in flight. The data, whether gathered on the ground or during flight, is used to prepare a compensation curve.

General Considerations. Do not gather data during the period starting two hours before sunset and ending two hours after sunrise. Select a station that is static-clear and operating below 500 kc.

Obtaining Ground Data for Loop Compensation. To obtain ground data for loop compensation, proceed as follows:

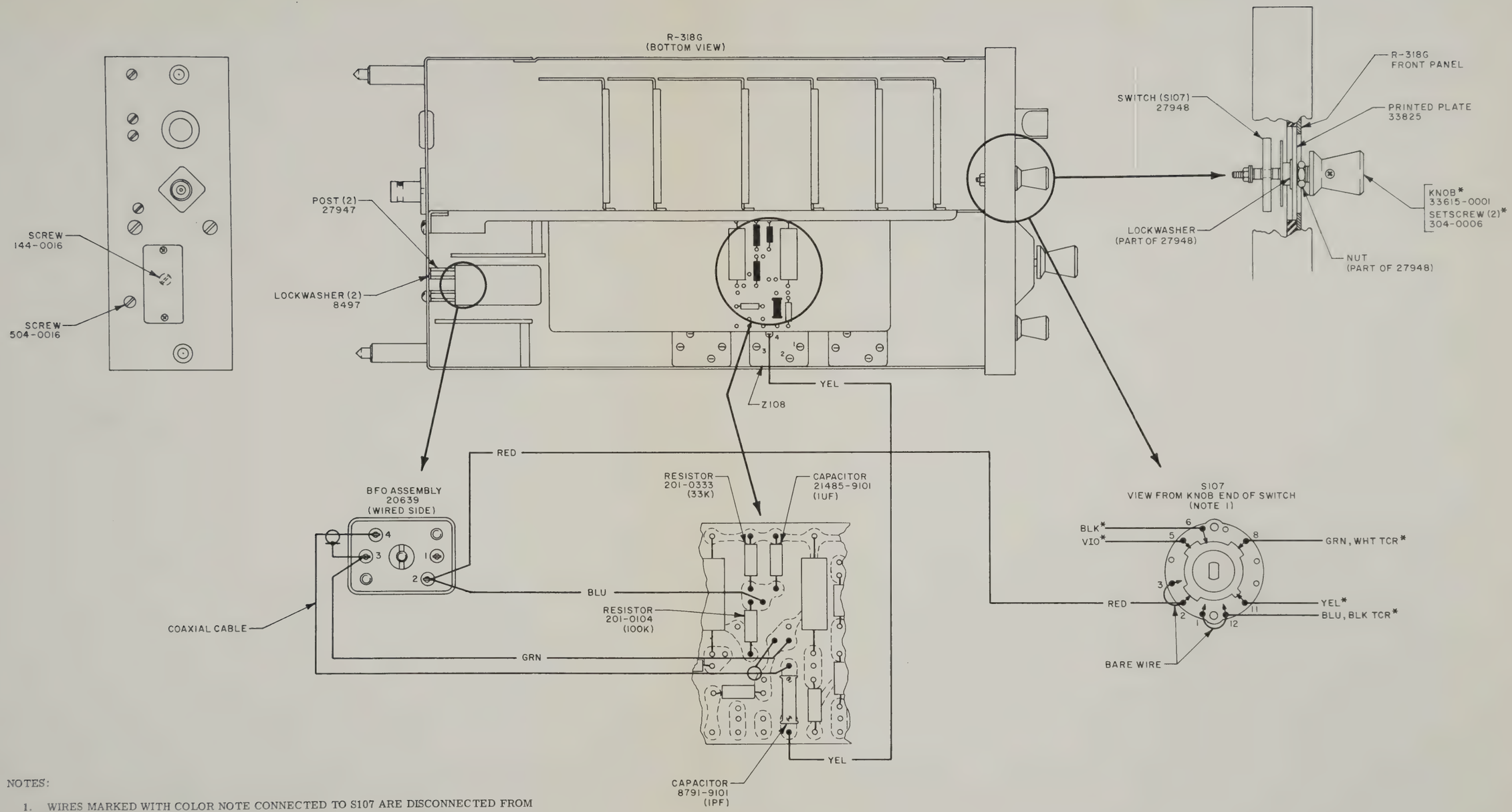
Step 1. Position aircraft in an area clear of all objects which may cause distortions or reflections of received signal.

Step 2. Select a station having a known magnetic compass bearing. Using a compass or transit, align centerline of aircraft with magnetic bearing of station. Align 0° of dial at index on goniometer-indicator.

Step 3. If DG is not slaved, set it to 0°. If DG is slaved, determine heading required to produce desired relative bearings.

Step 4. Turn aircraft clockwise through 360°, recording goniometer-indicator bearing indications every 15° on a form similar to that shown in Figure 2-15 (a completed form is shown in Figure 2-19).

Step 5. Repeat Step 4, turning aircraft counterclockwise through 360°.



NOTES:

1. WIRES MARKED WITH COLOR NOTE CONNECTED TO S107 ARE DISCONNECTED FROM FUNCTION SWITCH.
2. PARTS MARKED WITH ASTERISK (*) ARE NOT SUPPLIED WITH BFO KIT.

TP4255

Figure 2-12. BFO Kit 33838, Installation and Interconnection Diagram

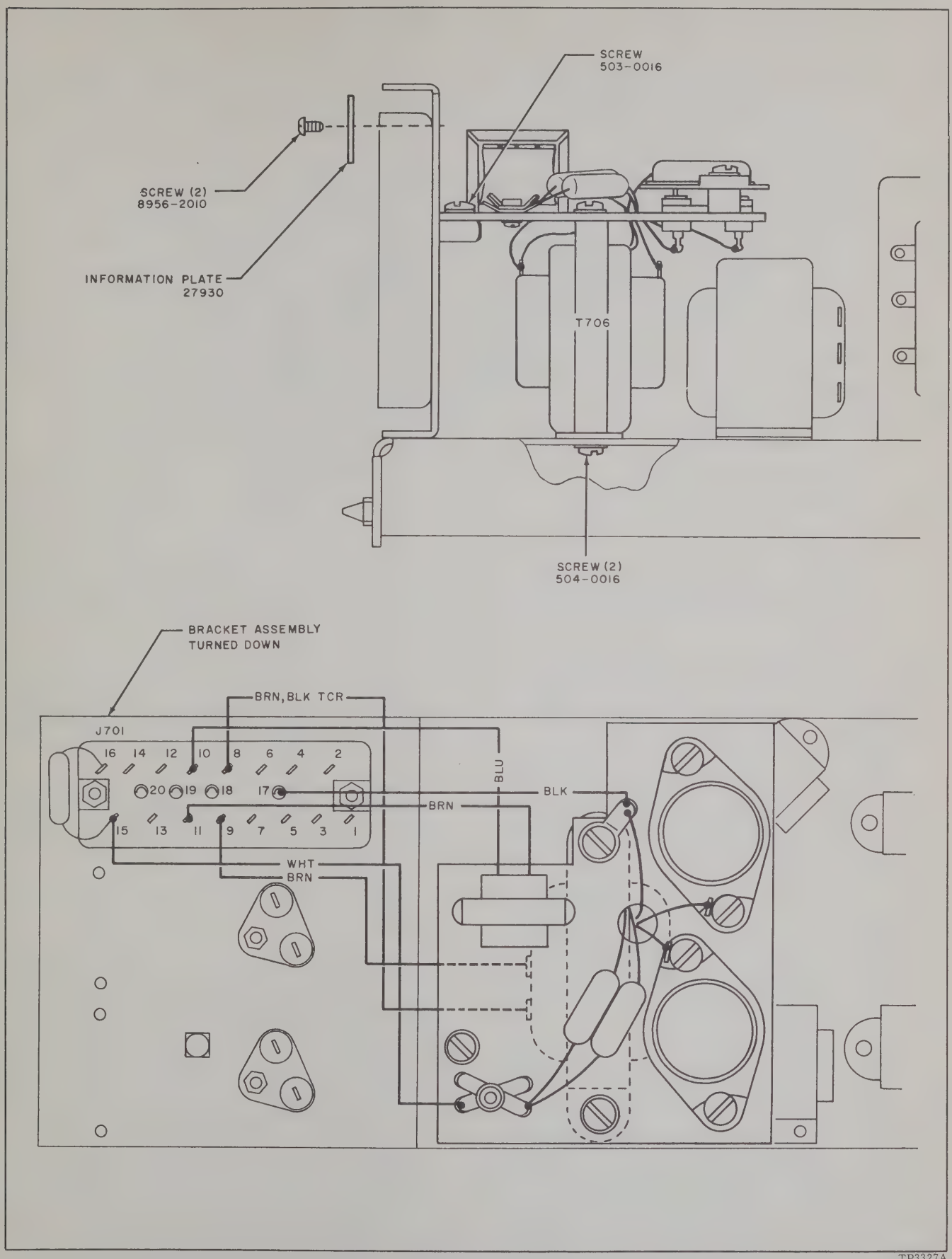


Figure 2-13. Audio Amplifier Kit 27624, Installation Diagram

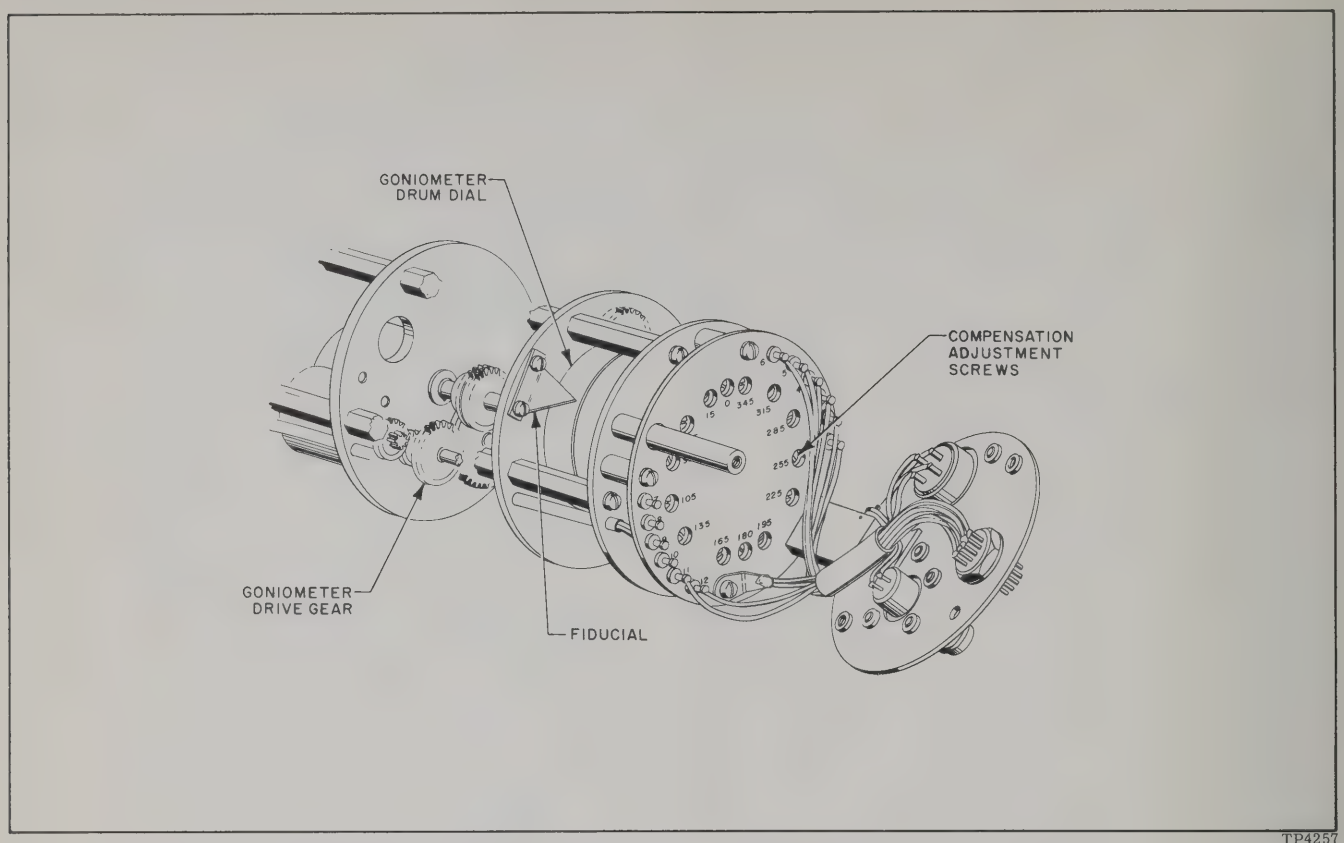


Figure 2-14. Goniometer-Indicator, Compensation Adjustment Points

Obtaining Flight Data for Loop Compensation.

General. Two methods for obtaining flight data are described in the following paragraphs.

Method 1. The following procedure (see Figure 2-16) requires a fairly linear ground-reference landmark, such as a road or railroad tracks, directed toward a clear-channel radio station at least 60 miles distant. Possible distortion of the radio field may be caused by certain structures such as power lines, steel towers, etc., on the route selected. To check whether such distortion exists, crisscross the reference line at various angles, while maintaining fixed courses by means of the DG. If rapid changes in the bearing are noted as the line is crossed, distortion exists. This distortion should be eliminated either by selecting another landmark, or by flying at a higher altitude.

Step 1. With aircraft in level flight headed toward radio station, fly reference line at an altitude low enough for accurate determination of position and direction. Set DG to 0° if DG is not slaved. (If the aircraft has a slaved gyro, determine heading required to produce desired relative bearings.) Turn VAR. knob to align dial 0° position with index at top of goniometer-indicator. Turn aircraft to a 0° heading. Record relative bearing read on goniometer-indicator on a form similar to that shown in Figure 2-15 (a completed form is shown in Figure 2-19).

Step 2. Fly a sufficient distance from reference line so that it may be crossed at a heading of 15°. With aircraft held in level flight on a heading of 15°, record relative bearing read on goniometer-indicator when reference line is crossed.

Step 3. Fly sufficiently past reference line so that line may be recrossed at a heading of 345° with aircraft in level flight (see Figure 2-16). Record goniometer-indicator bearing when aircraft crosses reference line.

Step 4. Repeat Steps 2 and 3 for headings of 30° and 330°.

Step 5. Turn aircraft to a heading of 180° from radio station and check DG reading when heading of aircraft coincides with reference line. DG reading should be within approximately 2° of a 180° heading if all maneuvers were made properly. If precession of DG is noted when 180° reference line course is checked, repeat procedure, or check DG. Normal creeping of a free DG (2° or less over a period of 15 minutes) may be proportioned to each heading.

Step 6. With aircraft on a 180° heading away from radio station, follow a procedure similar to that outlined previously and obtain goniometer-indicator bearings for headings of 195°, 165°, 210°, and 150° (see Figure 2-16). Then, turn aircraft to head toward radio station along reference line, establishing a 0° heading with respect to reference line.

FLIGHT DATA FOR LOOP COMPENSATION

Station Used _____ Frequency _____

Pilot _____ Recorder _____

Reference Point _____ Date _____

Aircraft Type _____ Aircraft No. _____

FLIGHT DATA			LOOP COMPENSATION DATA	
Column 1	Column 2	Column 3	Column 4	Column 5
Aircraft Relative Heading	Station Relative Bearing	Goniometer-Indicator Reading	Goniometer-Indicator Dial Reading	Compensated Goniometer-Indicator Reading
0	360		0	
15	345		345	
30	330		—	
45	315		315	
60	300		—	
75	285		285	
90	270		—	
105	255		255	
120	240		—	
135	225		225	
150	210		—	
165	195		195	
180	180		180	
195	165		165	
210	150		—	
225	135		135	
240	120		—	
255	105		105	
270	90		—	
285	75		75	
300	60		—	
315	45		45	
330	30		—	
345	15		15	
360	0		0	

TP4259

Figure 2-15. Form for Recording Flight Data for Loop Compensation

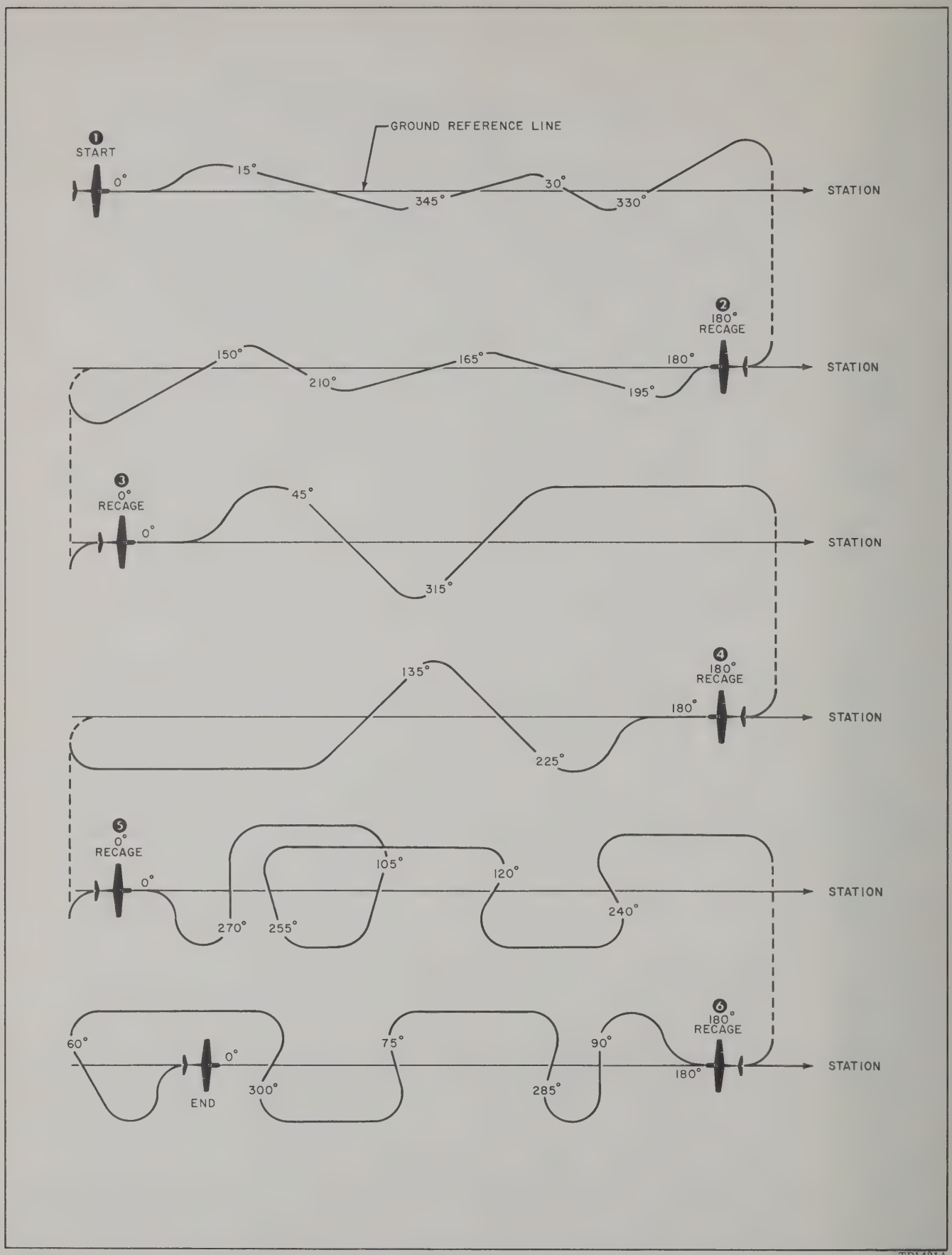


Figure 2-16. Procedure for Obtaining Flight Data for Loop Compensation, Flying Ground Reference Line

Step 7. Continue to fly to and from radio station, crisscrossing reference line, as shown in Figure 2-16, until goniometer-indicator bearings for every 15° change in heading of aircraft have been recorded. Recorded data will be used for compensation.

Note

The procedure outlined in Steps 1 through 7 may be made over a single point, such as a radio intersection, provided the bearing to the radio station is known. Fly a series of figure eights, always crossing the reference point on a 15° heading change from the previous course. Record the goniometer-indicator bearing each time the aircraft crosses the reference point.

Method 2. The following procedure requires making two 360° flight turns in opposing directions, some distance from a radio station. A landmark, such as a crossroad or a building, is used for a ground reference point from which each circle is started. Disregarding errors introduced by flight conditions or observation procedures, the accuracy of this procedure depends on the distance of the reference point from the radio station and the diameter of the two circles. The ground reference point should be as far as possible from the radio station, but still at a distance where reliable bearing indications can be obtained. The diameter of the circles should be nearly equal so that the error angles at corresponding angles of the turn circles cancel when averaged. The diameters should also be as small as possible, yet large enough so that the flying time during each chord of the circle is sufficient to permit obtaining a reliable reading. Generally, it is suggested that the distance between the ground reference point and the radio station be at least 60 miles, and that each circle have a maximum diameter of 9 miles.

Before the actual flight procedure is begun, it is necessary to correlate the 0° bearing of the goniometer-indicator with the 0° heading of the aircraft. This may be done by the following method.

Step 1. Head the aircraft directly toward a radio station whose transmitting tower is clearly visible.

Step 2. Tune receiver to station frequency. Adjust VAR. knob to align the dial 0° position with index at top of goniometer-indicator.

Step 3. Using a cross-hair sight which has been aligned accurately with fore-and-aft axis of aircraft, align axis of aircraft with station antenna tower as accurately as possible. If a cross-hair sight is not

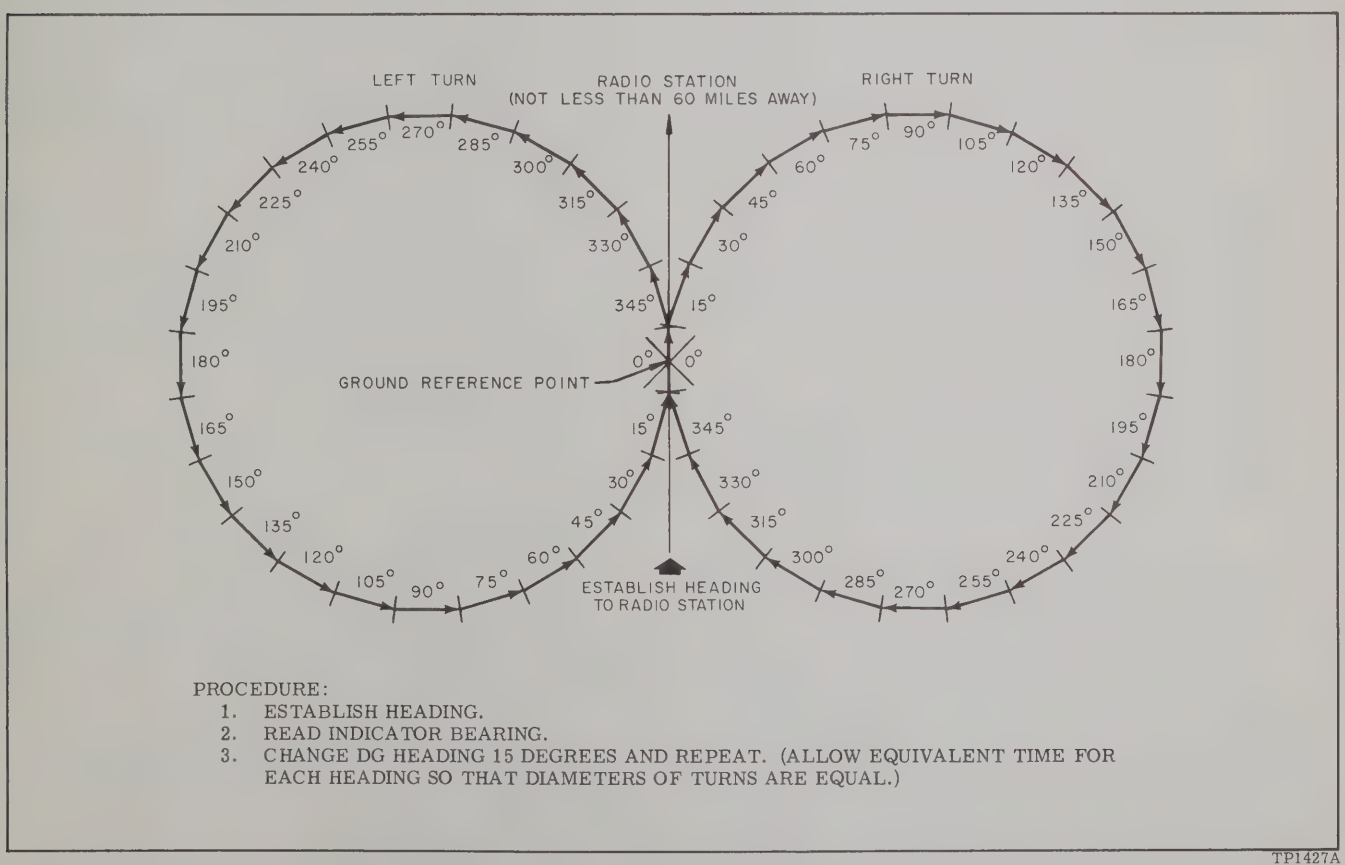


Figure 2-17. Procedure for Obtaining Flight Data for Loop Compensation, Flying Two 360-degree Turns

available, aircraft heading and tower may be aligned by an observer stationing himself as far aft as possible, with a clear line-of-sight through vertical center of windshield, and sighting along centerline of aircraft through center of windshield. Heading checks made directly from cockpit are not reliable because parallax errors may result.

Step 4. With aircraft held in level flight, and headed directly toward station tower, note goniometer-indicator bearing. To confirm reading obtained, approach station tower from the opposite direction and check that goniometer-indicator bearing is the same. Record goniometer-indicator bearing obtained for 0° heading of aircraft.

With the 0° goniometer-indicator bearing and the 0° aircraft heading correlated, the flight procedure may be performed (see Figure 2-17). The principle of this procedure is to obtain goniometer-indicator readings for every 15° change in heading during each of the 360° turns. To approximate a circle as closely as possible, the flying time and speed of each 15° course should be very nearly equal. After each turn has been completed, a goniometer-indicator reading relative to a given DG reading will be obtained for each turn. The goniometer-indicator readings are averaged and the result is used for loop compensation. Proceed as follows:

Step 1. Select a ground reference point which is not less than 60 miles from radio station to be used. Approach reference point so that it is between aircraft and station. Orient aircraft for a 0° bearing on goniometer-indicator. If previous flight procedure has established that 0° heading of aircraft does not coincide with 0° bearing of station within ±2°, fly aircraft on heading that corresponds to 0° bearing obtained in preliminary flight procedure.

Step 2. With aircraft held in steady, level flight directly toward station, set DG to 0°. (If a slaved DG is installed in aircraft, determine proper heading.) Maintain heading, and when aircraft is over ground reference point, record goniometer-indicator bearing.

Step 3. Turn aircraft smoothly and evenly to right for a heading of 15°. With aircraft leveled out on this heading for not more than 25 seconds, note and record goniometer-indicator bearing on a form similar to that shown in Figure 2-15.

Step 4. Turn aircraft to a heading of 30°. After level flight has been reassumed, note and record goniometer-indicator bearing.

Step 5. Follow a similar procedure as outlined previously in Steps 3 and 4 for each 15° increase in heading of aircraft, until circle-turn is completed. Record the goniometer-indicator bearings for each heading. If turn has been executed properly, aircraft should be over reference point at the end of last 15° turn. Turn aircraft for a 0° goniometer-indicator bearing. The aircraft should now be headed directly toward radio station in line with original starting line. Check relative bearing for this heading; reading should agree with its original setting within 2° to 3° if all turns have been made properly.

Step 6. With aircraft over ground reference point and headed directly toward station, as shown by goniometer-indicator reading, check that the DG reading agrees with its original setting. If not, make a 0° reference check, as outlined in Steps 1 and 2 of this procedure.

Step 7. Start second 360° turn by turning aircraft to left for a 345° heading. When aircraft is in steady, level flight on this heading, record goniometer-indicator bearing.

Step 8. Continue circle turn, until completed, decreasing heading in 15° intervals. Keep diameter of this left turn as equivalent as possible to right turn made previously. Record goniometer-indicator bearing for each 15° change in heading.

Step 9. Average right-turn and left-turn goniometer-indicator bearings for each corresponding DG heading. Recorded averages will be used for compensation.

Preparation of Compensation Data Curve. After the in-flight compensation data has been recorded, the data may be plotted and the resulting curve used for determining the compensation adjustments. Proceed as follows:

Step 1. Using a form similar to that shown in Figure 2-18, plot goniometer-indicator bearing (column 3) against corresponding aircraft-to-station bearing (column 2, Figure 2-15). An example of a resultant curve is shown in Figure 2-19.

Step 2. Lay a straight edge parallel to sloping dotted line and through data point of column 3 on horizontal scale, and draw a fine line (see Figure 2-19). Point at which this line intersects solid line is plot point. (Example shown in Figure 2-19 indicates that for an actual bearing of 15°, goniometer-indicator bearing is 30°.)

Step 3. Repeat Step 2 for each of remaining 15° positions.

Step 4. Connect plotted points to form compensation data curve.

Step 5. Determine compensated goniometer-indicator bearing values for column 5 of Figure 2-15 (see Figure 2-19 for example) from resulting curve as follows:

a. Draw fine lines parallel to solid lines at intersections of plotted curve and dotted lines corresponding to degree values given in column 4 of Figure 2-15.

b. In column 5 of Figure 2-15, record values for points of intersection as read on vertical

graduations beside 15° dotted line values in column 4. For example: To determine corrected goniometer-indicator bearing for a loop position of 45° (column 4), lay straight edge parallel to solid line and draw a fine line through intersection of dotted 45° line and curve (see Figure 2-19). This line passes through vertical graduations at 63°. This value is recorded in column 5. Similarly, a bearing of 105° from column 4 gives a bearing of 100° for column 5.

Goniometer-Indicator Adjustment Procedure. To compensate the goniometer-indicator, proceed as follows:

Step 1. Disconnect cables from goniometer-indicator and remove unit from instrument panel.

Note

Compensation can be performed without power applied to goniometer-indicator.

Step 2. Remove dust cover from goniometer-indicator. Remove screw on rear plate and swing down hinged rear plate (see Figure 2-14).

Step 3. Align 0° on dial with index on front of goniometer-indicator using VAR. knob.

Step 4. Using goniometer drive gear (see Figure 2-14), align 0° mark on goniometer dial with fiducial. Hold goniometer-indicator so that all gears rotate freely.

Step 5. Adjust 0° compensation screw until the goniometer-indicator pointer indicates computed value for 0° in column 5 of Figure 2-15.

CAUTION

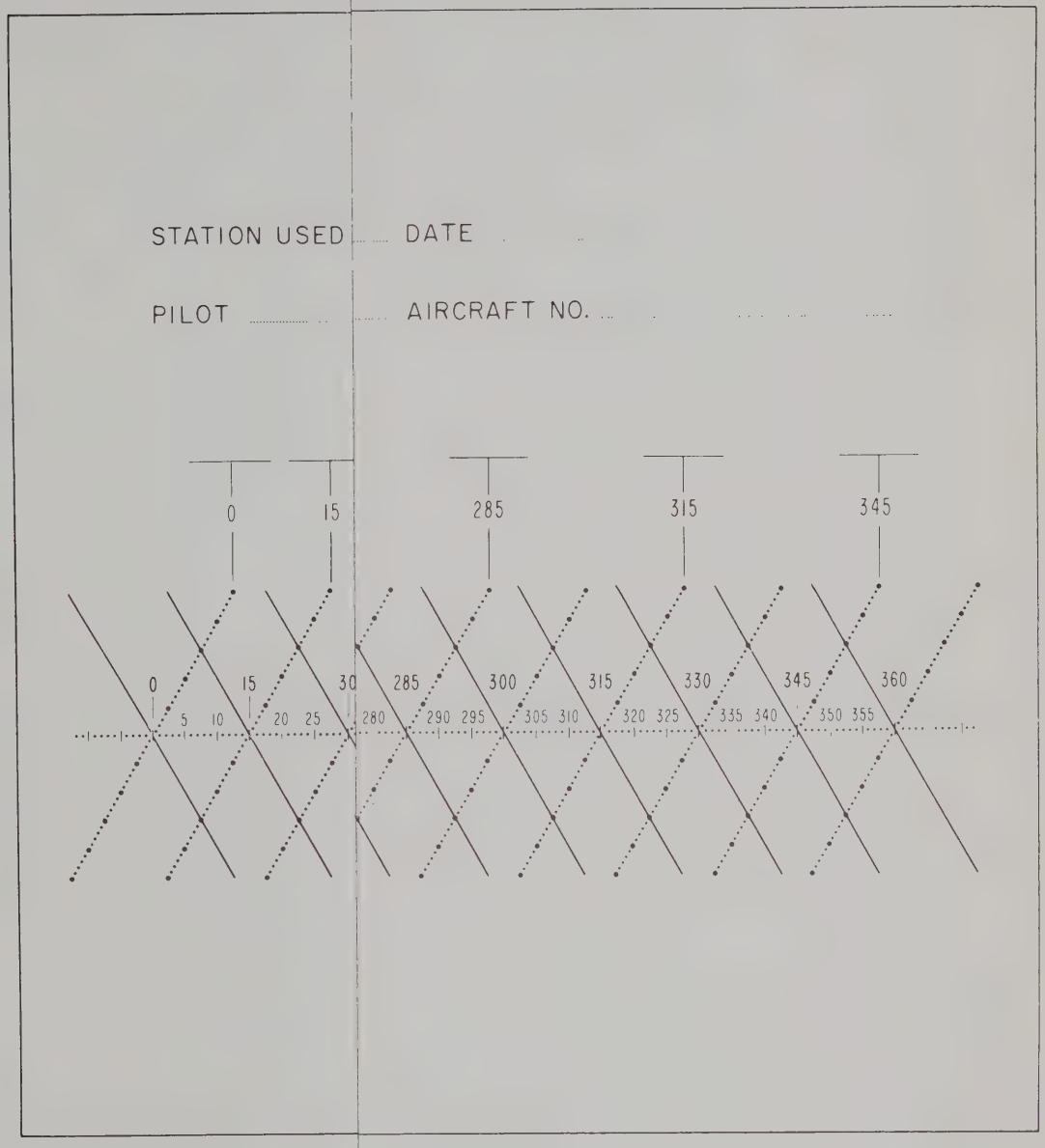
Do not force screws. In the following procedure, it may seem at first that the compensation available at a particular point is insufficient to make the indicator read correctly. If this occurs, do not force the screw in question, but proceed to set the other screws. When, as required by Step 8, the adjustment procedure is repeated, it will be found that sufficient compensation is available from all adjustment points.

Step 6. Align 15° mark on goniometer dial with fiducial using goniometer drive gear (see Figure 2-14). Adjust 15° compensation screw until goniometer-indicator pointer indicates computed value for 15° in column 5 of Figure 2-15.

Step 7. Continue adjustment for each screw, using computed value in column 5 of Figure 2-15 for screw being adjusted.

Step 8. Repeat Steps 4 through 7 until satisfactory compensation has been achieved

Step 9. Reassemble and reinstall goniometer-indicator.



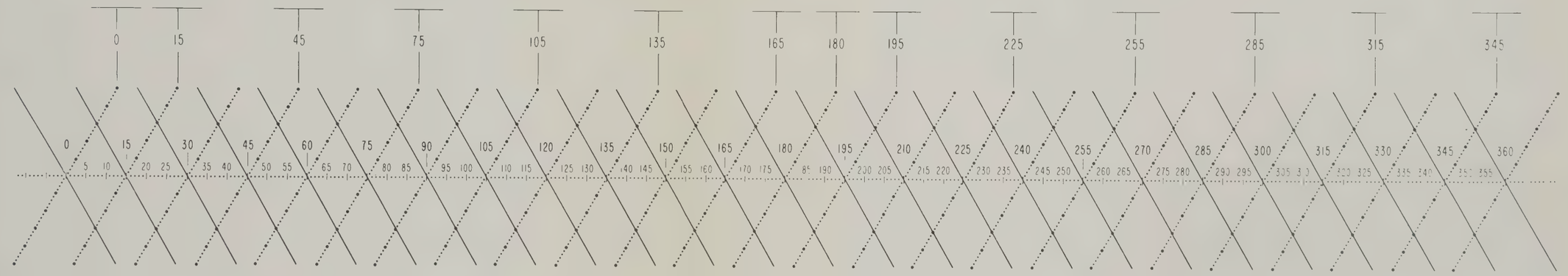
TP4261

Figure 2-18. Form for Plotting Loop Compensation Data Curve

LOOP COMPENSATION DATA CURVE

STATION USED ..... FREQUENCY ..... REF POINT ..... DATE

PILOT ..... RECORDER ..... AIRCRAFT TYPE ..... AIRCRAFT NO.



TP4201

Figure 2-18. Form for Plotting Loop Compensation Data Curve

FLIGHT DATA FOR I

Station Used ABC

Pilot F.G. NEUBAUER

Reference Point ARC AIRFIELD

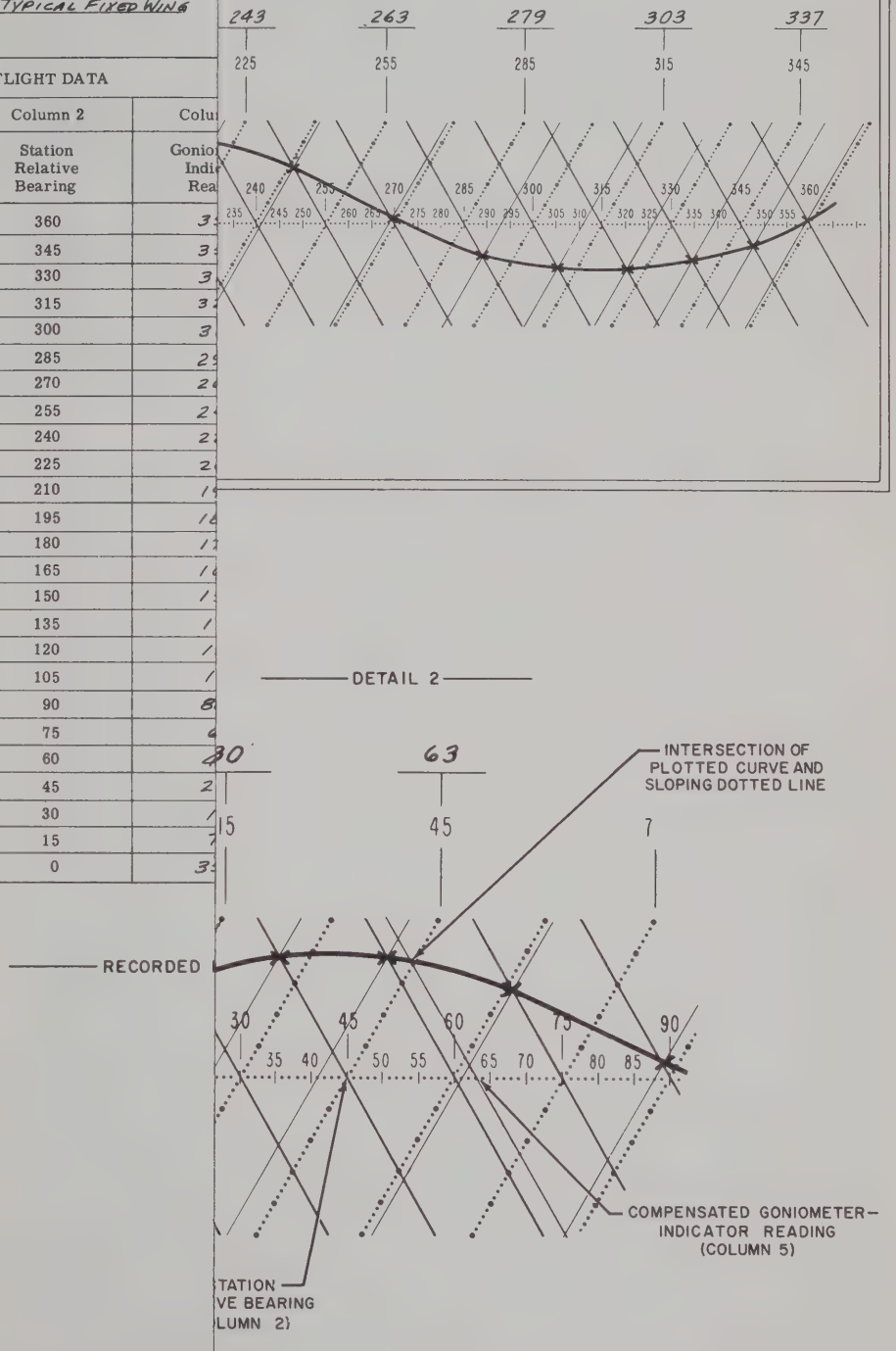
Aircraft Type TYPICAL FIXED WING

...IELD ..... DATE NOVEMBER 2, 1964

...L FIXED WING ..... AIRCRAFT NO. N12345

FLIGHT DATA

Column 1	Column 2	Colu
Aircraft Relative Heading	Station Relative Bearing	Gonio Indi Rea
0	360	3
15	345	3
30	330	3
45	315	3
60	300	3
75	285	2
90	270	2
105	255	2
120	240	2
135	225	2
150	210	1
165	195	1
180	180	1
195	165	1
210	150	1
225	135	1
240	120	1
255	105	1
270	90	8
285	75	4
300	60	3
315	45	2
330	30	1
345	15	7
360	0	3



TP4263

Figure 2-19. Example of Recorded Flight Data and Loop Compensation Curve

FLIGHT DATA FOR LOOP COMPENSATION

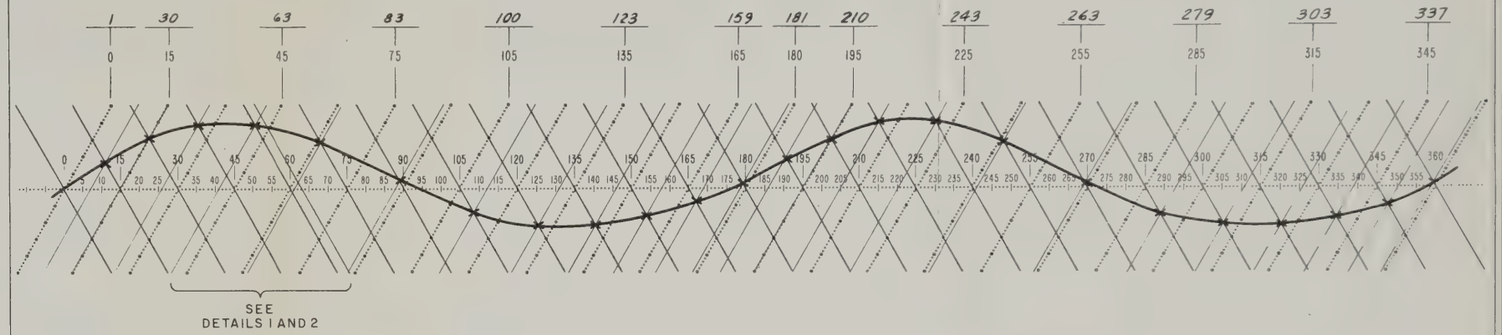
Station Used ABC — Frequency 330 KC
Pilot F.G. NEUBAUER — Recorder F.E. KLENA
Reference Point ARC AIRFIELD — Date NOVEMBER 2, 1964
Aircraft Type TYPICAL FIXED WING — Aircraft No. N12345

FLIGHT DATA			LOOP COMPENSATION DATA	
Column 1	Column 2	Column 3	Column 4	Column 5
Aircraft Relative Heading	Station Relative Bearing	Goniometer-Indicator Reading	Goniometer-Indicator Dial Reading	Compensated Goniometer-Indicator Reading
0	360	359	0	1
15	345	350	345	337
30	330	339	—	—
45	315	326	315	303
60	300	311	—	—
75	285	293	285	280
90	270	269	—	—
105	255	241	255	264
120	240	220	—	—
135	225	205	225	244
150	210	195	—	—
165	195	186	195	210
180	180	179	180	184
195	165	169	165	158
210	150	158	—	—
225	135	146	135	123
240	120	131	—	—
255	105	112	105	100
270	90	88	—	—
285	75	61	75	83
300	60	41	—	—
315	45	26	45	63
330	30	15	—	—
345	15	7	15	30
360	0	359	0	1

RECORDED FLIGHT DATA

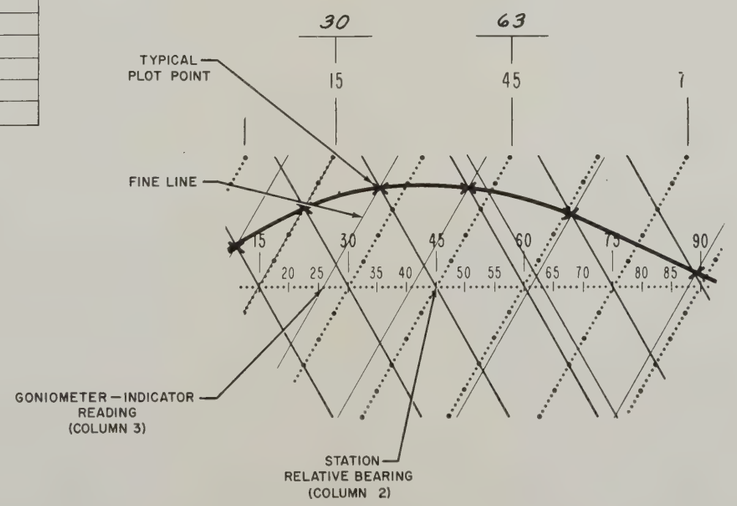
LOOP COMPENSATION DATA CURVE

STATION USED ABC — FREQUENCY 330 KC — REF POINT ARC AIRFIELD — DATE NOVEMBER 2, 1964
PILOT F.G. NEUBAUER — RECORDER F.E. KLENA — AIRCRAFT TYPE TYPICAL FIXED WING — AIRCRAFT NO. N12345

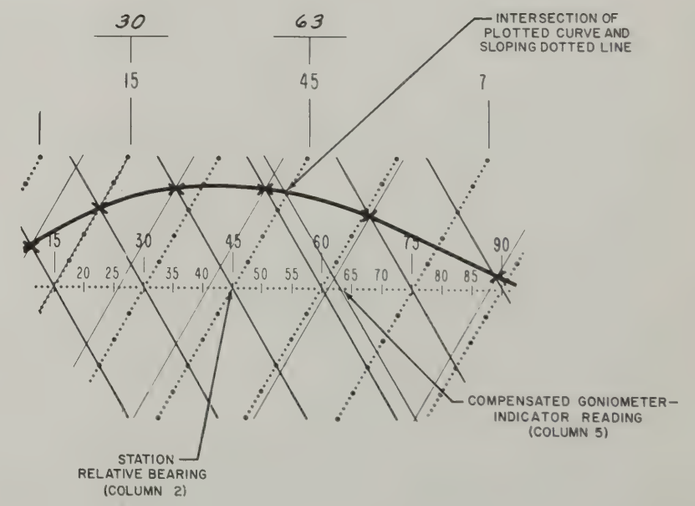


PLOTTED COMPENSATION CURVE

DETAIL 1



DETAIL 2



TP4263

Figure 2-19. Example of Recorded Flight Data and Loop Compensation Curve

SECTION III

OPERATION

3-1. INTRODUCTION.

This section outlines the general procedure for operating the ADF set. Detailed operating procedures are described and illustrated in the pilot's manual.

3-2. OPERATING CONTROLS AND INDICATORS.

Operating controls and indicators, shown in Figure 3-1, are located on the receiver and goniometer-indicator. Table 3-1 lists the front panel designations and describes the functions of the controls and indicators.

3-3. GENERAL OPERATING PROCEDURE.

Step 1. Rotate VOLUME control clockwise until panel lamps light. Allow approximately 30 seconds for equipment to warm up.

Step 2. Set function switch to COMP.

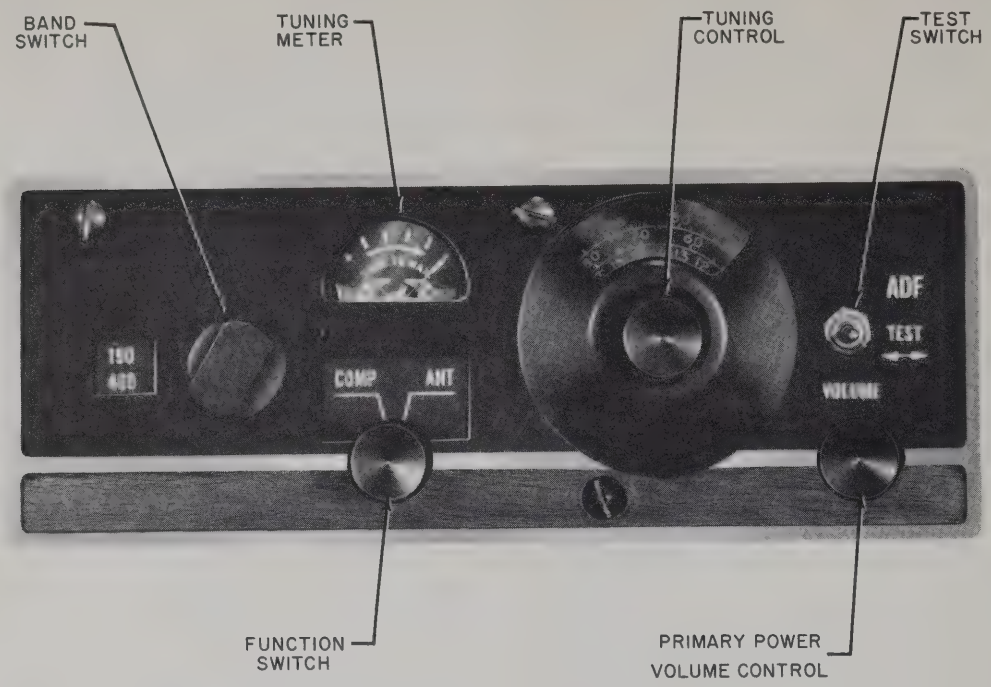
Step 3. Set band switch to desired frequency band.

Step 4. Adjust VOLUME control until background noise (or station if already tuned in) is heard.

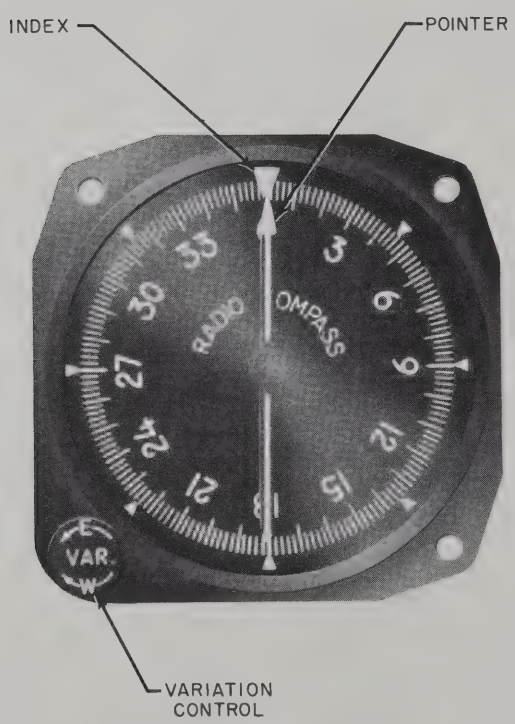
TABLE 3-1. OPERATING CONTROLS AND INDICATORS

Designation	Control or Indicator	Function
		RECEIVER
VOLUME	Primary Power and Volume Control	Combined primary power and volume control. Clockwise rotation applies power to ADF set. Further clockwise rotation increases audio level.
—	Function Switch	COMP: Set operates as automatic direction finder using loop and sense antennas. ANT: Set operates as standard communication receiver using sense antenna only. BFO[1]: Permits identification of keyed CW signals.
—	Band Switch	Selects desired frequency band.
—	Tuning Control	Selects desired frequency within selected frequency band.
—	Tuning Meter	Maximum deflection indicates accurate adjustment of tuning control.
TEST	Test Switch	Used to test operation and signal reliability.
		GONIOMETER-INDICATOR
VAR.	Variation Control	Rotates dial to introduce relative, magnetic, or true bearing information.
—	Index	When VAR. control is adjusted, indicates relative, magnetic, or true heading of aircraft.
—	Pointer	When VAR. control is adjusted, indicates relative, magnetic, or true bearing from which r-f signal is being received.

[1]Optional.



R-318G RECEIVER



IN-21C GONIOMETER-INDICATOR

TP1636

Figure 3-1. 318G Automatic Direction Finder, Operating Controls and Indicators

Step 5. Adjust tuning control until station frequency is aligned with fiducial line, then tune for maximum deflection on tuning meter by slowly adjusting tuning control in vicinity of desired frequency.

Step 6. Readjust VOLUME control to desired audio level. Identify station.

Step 7. Set function switch to position required for desired operation.

a. To use as an automatic direction finder, set function switch to COMP and readjust tuning control for maximum indication on tuning meter.

b. To use as a low-frequency communication receiver, set function switch to ANT and readjust tuning control for best aural reception.

3-4. BFO OPERATION.

When the optional BFO kit is installed in the receiver, the two-position function switch is replaced with a three-position function switch. The additional switch position is for BFO operation. With the function switch set at BFO, CW transmissions, such as those employed in areas outside the U.S.A., may be readily identified.

To tune in a CW signal, proceed as follows:

Step 1. Set function switch to BFO.

Step 2. Tune to desired frequency for maximum audio (900-cps) tone.

Step 3. Detune receiver slightly until a second 900-cps tone is heard.

Note

As the frequency is varied, the audio tone will decrease from a high pitch to zero, then increase again to a high pitch on the other side of the zero beat. Consequently, there are two dial settings, or frequencies, which produce a maximum audio signal.

Step 4. Tune receiver to lower of two adjacent dial settings.

SECTION IV

MAINTENANCE

4-1. INTRODUCTION.

This section contains maintenance information for the units of the 318G Automatic Direction Finder. Included are a list of test equipment and accessories required for maintenance, removal and replacement procedures, disassembly procedures, performance checks, alignment and adjustment procedures, and voltage, resistance, and stage gain measurements. Schematic and wiring diagrams for the units are included in Section V.

WARNING

VOLTAGES IN THIS EQUIPMENT MAY BE FATAL IF CONTACTED. OBSERVE ALL SAFETY PRECAUTIONS.

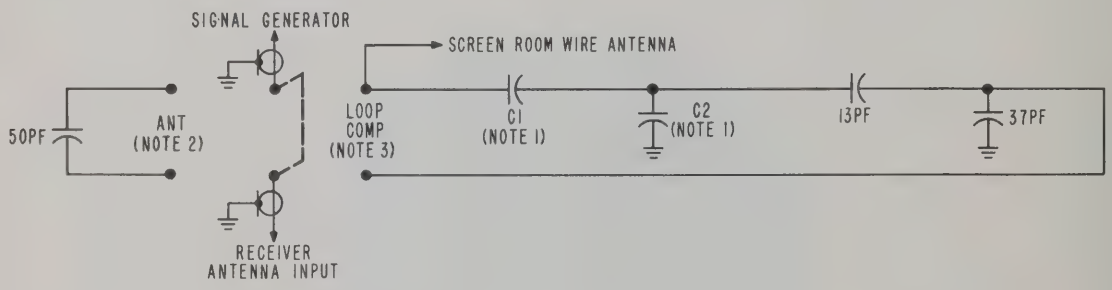
4-2. TEST EQUIPMENT AND ACCESSORIES.

Table 4-1 lists the test equipment and accessories required for maintenance of the 318G; equivalent test equipment and accessories may be substituted. Use of the BTK-318G is recommended to facilitate maintenance procedures. If the BTK-318G is not available, either the SA-40B Antenna Position Simulator (which is part of the BTK-318G) or a calibrated screen room is required.

If a calibrated screen room[1] is used, provision must be made for the sense antenna input to the receiver. For this purpose, an r-f capacitive line divider must be connected between the signal generator, which energizes the screen room radiating wire, and the sense antenna cable. This line divider must have an attenuation of 4:1 for 1/4-meter effective height times the screen room field attenuation factor[2] and, in addition, must have an output capacitance of 50 pf. An r-f line divider for a screen room and a table listing the capacitor values for several room factors are shown in Figure 4-1. The addition of a 50-pf dummy antenna capacitor and a DPDT switch as a function selector switch provides a convenient method of selecting either the communication (ANT) or ADF (COMP) signal input for the receiver.

[1]The construction and calibration of a suitable screen room is described in RTCA Paper 83-56/DO-70, RTCA Secretariat, 16 and Constitution Avenues N.W., Washington 25, D.C.

[2]Screen room attenuation factor = $\frac{\text{signal generator output } (\mu v)}{\text{field strength } (\mu v/\text{meter})}$



NOTES:

1. TO DETERMINE VALUE OF C1 AND C2 (IN $\mu\mu$F) FOR ANY ROOM FACTOR, USE THE FOLLOWING FORMULA:

$$\text{ROOM FACTOR} = \frac{C1 + C2}{C1}$$

FOR KNOWN ATTENUATION RATIOS, THE FOLLOWING CHART MAY BE USED.

ROOM FACTOR	10:1	9:1	8:1	7:1	6:1	5:1	4:1	3:1
C1 (pF)	100	100	100	100	100	100	100	100
C2 (pF)	900	800	700	600	500	400	300	200

2. IN ANT POSITION, THE SIGNAL GENERATOR INDICATES THE ANTENNA OPEN-CIRCUIT MICROVOLTS DIRECTLY.
3. IN COMP POSITION, THE SIGNAL GENERATOR OUTPUT DIVIDED BY THE ROOM FACTOR IS EQUAL TO MICROVOLTS/METER FIELD STRENGTH.

TP4143A

Figure 4-1. Capacitive Line Divider for Screen Room

TABLE 4-1. TEST EQUIPMENT AND ACCESSORIES

Qty	Name	Designation or Characteristics
	TEST EQUIPMENT	
1	Audio Oscillator	Hewlett-Packard Model 200AB
1	Bearing Indicator[1]	ARC Type IN-12-1
1	Bench Test Kit consisting of:	ARC Type BTK-318G
1	Adapter Assembly	22770
1	ADF Test Panel	19770
1	Antenna Position Simulator[2]	ARC Type SA-40B
1	Cable Assembly	33711-*[3]
1	Loop Antenna Cable Assembly[2]	32803
1	Receiver Cable Assembly[2]	33488-0001
1	Sense Antenna Cable Assembly[2]	17984
1	Crystal Calibrator	Measurements Model 111-B
1	Frequency Meter[4]	94—116 cps, 10—15 volts
1	Multimeter	Simpson Model 260
1	Oscilloscope	Tektronix Model 310
1	R-f Voltmeter	Boonton Electronics Model 91C
1	Signal Generator	Measurements Model 65-B
1	Screen Room[5]	
1	Stop Watch	
1	Voltmeter	Hewlett-Packard Model 410B
1	Voltmeter	Ballantine Model 300D
1	Voltmeter[4]	0—20 volts ac
	ACCESSORIES	
1	Adapter	UG-273/U (11368)
AR	Cable	RG-58/U (11318)
1	Capacitive Line Divider[4]	Figure 4-1
1	Connector	UG-88C/U (11337)
1	Connector	27881
1	Connector	26795
1	Connector	33979
2	Connector	UG-274/U (14219)
1	Connector	14491
1	Resistor	300 ohms, 1/2 watt

[1]Required for testing of IN-21B Goniometer-Indicator only.
[2]Available as a separate item.
[3]Either 33711-0014 (14-volt) or 33711-0028 (28-volt) is supplied as specified.
[4]Not required if BTK-318G is used.
[5]Not required if SA-40B is used.

4-3. REMOVAL AND REPLACEMENT PROCEDURES.

General. Partial disassembly of the receiver is required to replace the r-f assemblies. The electron tubes, transistors, and most other electrical parts in the receiver and Dynaverter can be replaced without disassembly. The wiring diagrams included in Section V will aid in locating and identifying the parts. After a part has been replaced, the operation of the equipment should be checked. If any parts are replaced in the r-f assemblies, check the performance of the receiver as outlined in Table 4-2 and realign if necessary as outlined in Table 4-3.

Removal of Dust Cover. To remove the Dynaverter dust cover, remove the four screws located on the top of the unit and slide the dust cover off. To remove the goniometer-indicator dust cover, remove the two screws located on the rear and slide the dust cover off.

Replacement of Parts in Receiver I-f/A-f Circuits. The parts of the i-f/a-f circuits are mounted on the right side wall and on the bottom printed-circuit board of the receiver. To expose these parts, remove the three screws fastening the bottom printed-circuit board and fold the board outward.

Replacement of Tubes. All tubes in the receiver are subminiature types. These tubes use flexible leads which are soldered directly to a terminal point. When replacing a tube, the new tube should be oriented and its leads routed as nearly like the original as possible. Figure 4-2 is a tube location diagram. Tube wiring diagrams showing proper orientation and lead routing are shown in Figures 4-3 through 4-7. When replacing a tube, do not precut the leads

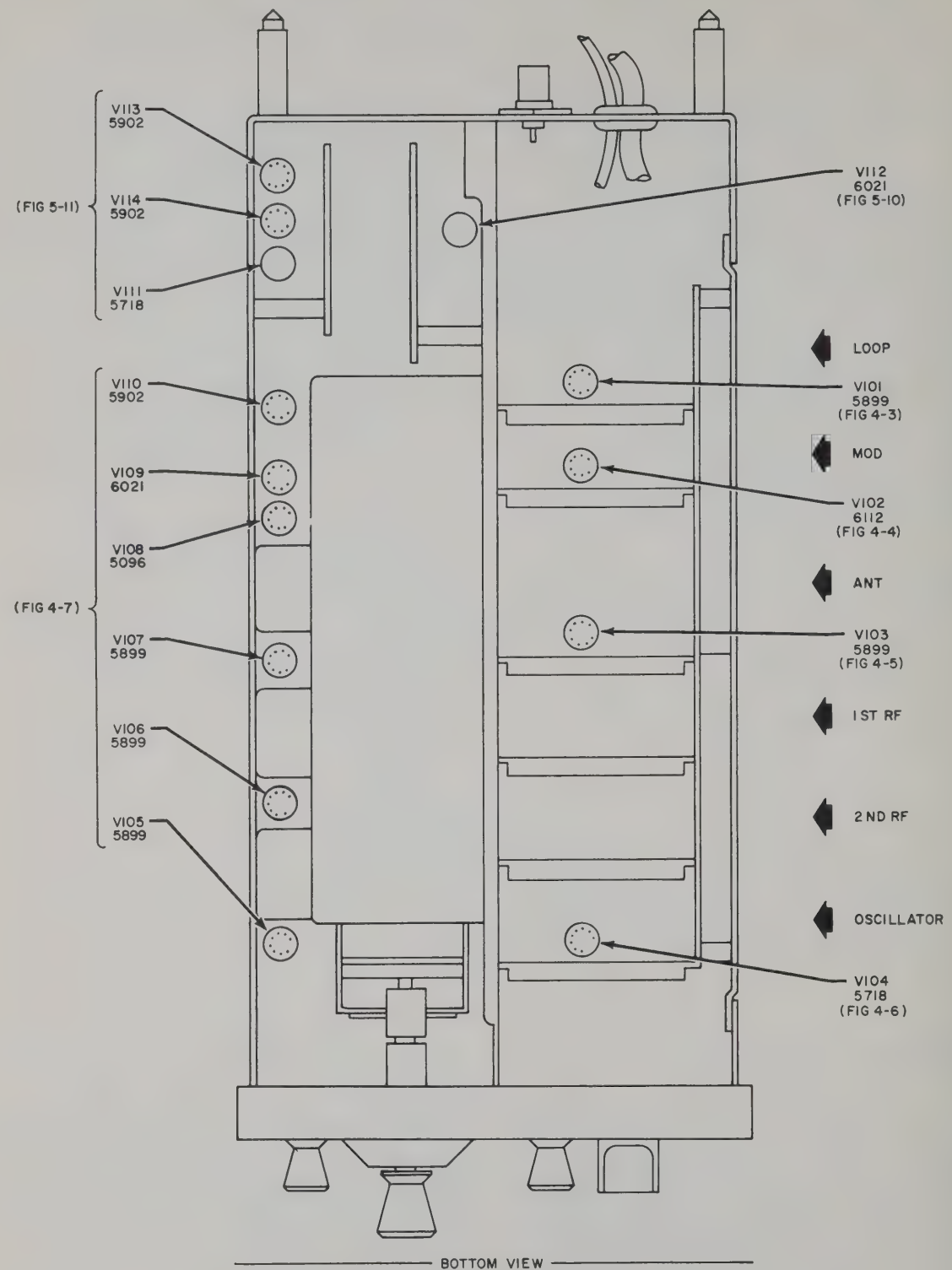
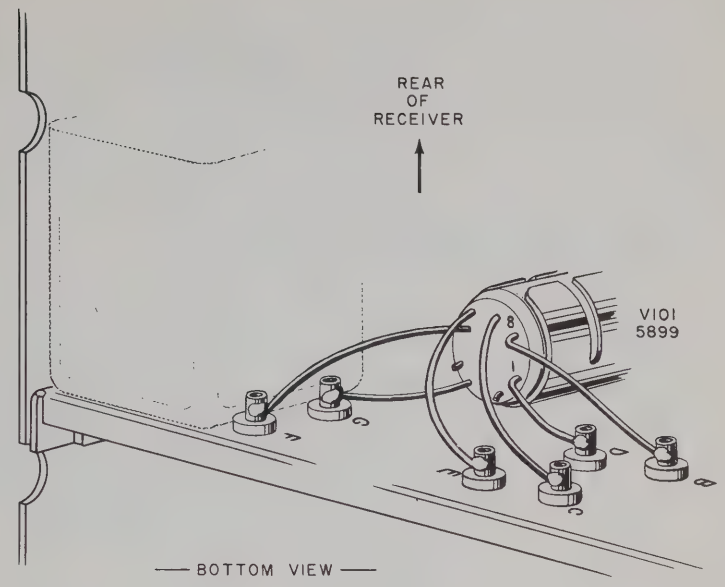


Figure 4-2. R-318G Receiver, Tube Location Diagram

NOTES:

1. CUT OFF UNUSED TUBE LEADS 2 AND 4 APPROXIMATELY 1/32 INCH FROM GLASS.
2. TUBE LEADS 1 AND 8 ARE INDICATED TO SHOW PROPER ORIENTATION OF TUBE.

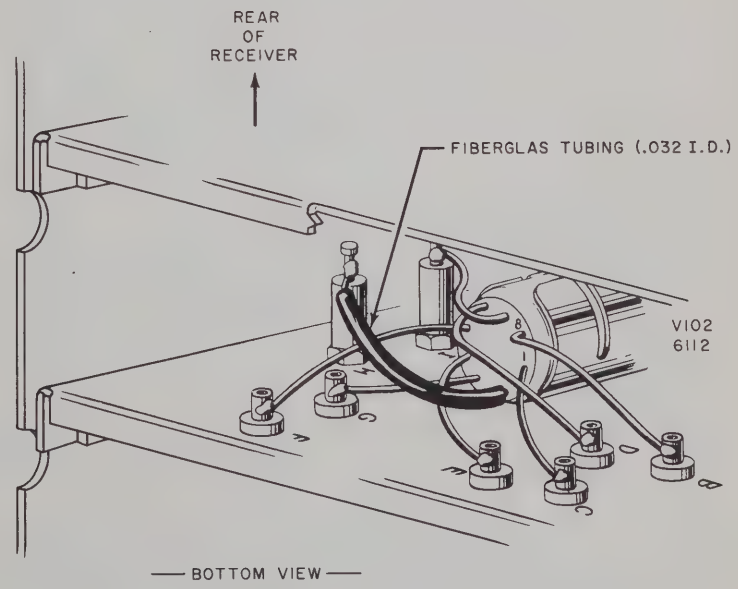


TP2043

Figure 4-3. Wiring of V101

NOTE:

TUBE LEADS 1 AND 8 ARE INDICATED TO SHOW PROPER ORIENTATION OF TUBE.

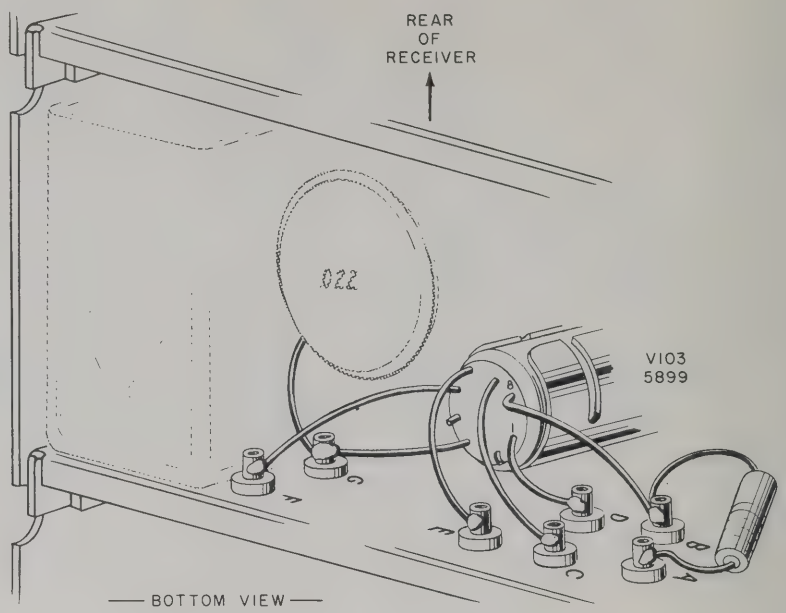


TP2045A

Figure 4-4. Wiring of V102

NOTES:

1. CUT OFF UNUSED TUBE LEADS 2 AND 4 APPROXIMATELY 1/32 INCH FROM GLASS.
2. TUBE LEADS 1 AND 8 ARE INDICATED TO SHOW PROPER ORIENTATION OF TUBE.

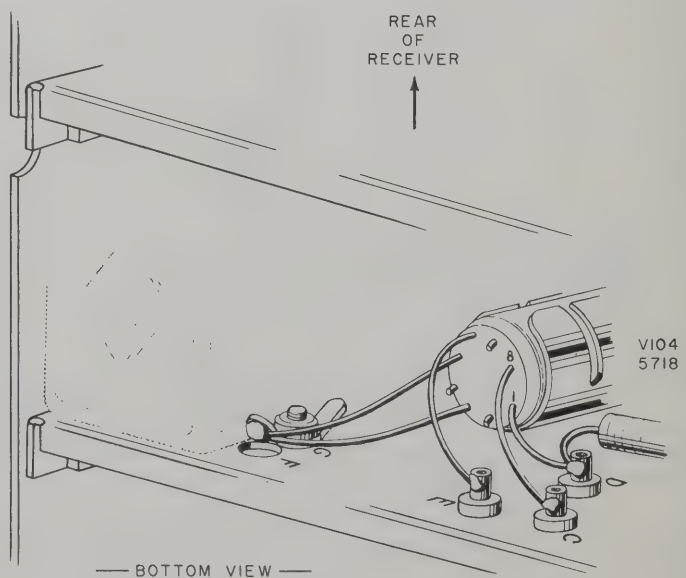


TP2047

Figure 4-5. Wiring of V103

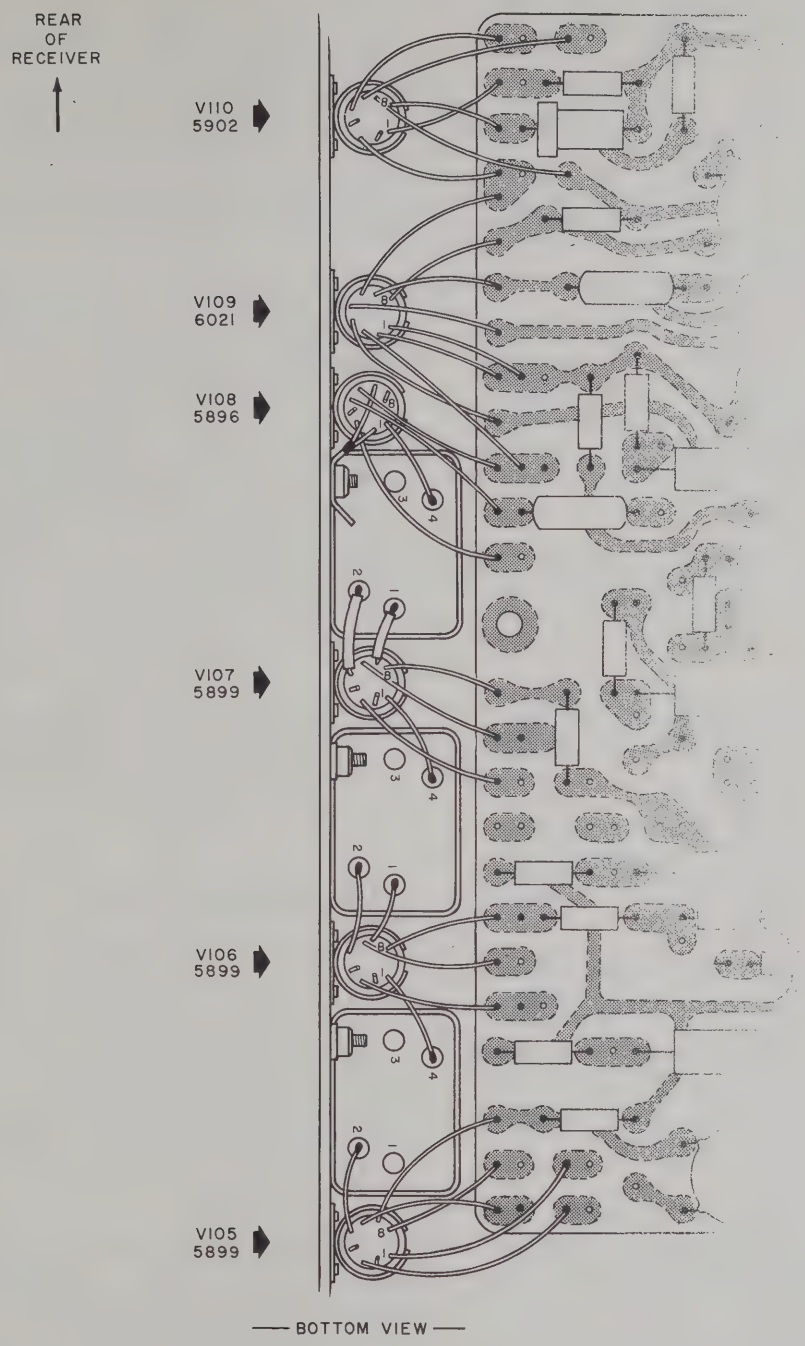
NOTES:

1. CUT OFF UNUSED TUBE LEADS 2, 4, AND 7 APPROXIMATELY 1/32 INCH FROM GLASS.
2. TUBE LEADS 1 AND 8 ARE INDICATED TO SHOW PROPER ORIENTATION OF TUBE.



TP2049

Figure 4-6. Wiring of V104



NOTES:
1. CUT OFF UNUSED TUBE LEADS APPROXIMATELY 1/32 INCH FROM GLASS.
2. TUBE LEADS 1 AND 8 ARE INDICATED TO SHOW PROPER ORIENTATION OF TUBE.

TP2051

Figure 4-7. Wiring of V105, V106, V107, V108, V109, and V110

before installation, keep the spacing between leads at least 1/16 inch, and use a minimum amount of solder.

Removal of Receiver R-f Assemblies. To remove any of the r-f assemblies, proceed as follows:

Step 1. Remove receiver from its mounting rack. Set tuning control knob counterclockwise to stop and band switch to 840—1750.

Step 2. Remove ten flat head screws from left side of chassis and lift detached plate from chassis.

Step 3. Loosen setscrews in control knobs and remove control knobs.

Step 4. Detach retaining nuts from VOLUME control, function switch, and TEST switch. Remove six binding head screws attaching front panel to receiver chassis. Carefully displace front panel and its wiring to expose band switch detent and shaft assembly.

Step 5. Remove two binding head screws and spacers that hold band selector switch shaft in position. Extract band switch detent and shaft assembly from chassis.

Step 6. Unsolder all green leads that interconnect r-f assembly and tuning capacitor. Unsolder all other wires interconnecting r-f assembly and other assemblies.

Step 7. Unscrew either two or four screws, depending on which r-f assembly is to be used, and detach r-f assembly from r-f assemblies adjacent to it.

Step 8. Remove two screws attaching r-f assembly to center partition plate. (With receiver in its normal position, these screws are located on right side of center partition plate adjacent to tuning capacitor. To obtain access to screws, it may be necessary to displace tuning capacitor. To displace capacitor, remove four screws attaching it to main chassis.)

Step 9. With bottom of receiver up, remove two screws and other attaching hardware used to hold r-f assembly to the center partition plate. (These screws are located beneath cable assembly adjacent to main printed-circuit board.)

Step 10. Lift r-f assembly from receiver.

Replacement of Receiver R-f Assemblies. To replace any of the r-f assemblies, reverse the procedure outlined previously for removal, but observe the following precautions:

Carefully inspect the front and rear wafer switch contacts for positive contact before replacing the band switch detent and shaft assembly in the receiver. Before engaging the long switch shaft in any switch rotor, be sure that the rotor is not oriented 180° from its proper position: All rotor notches should be on the same side of the flatted shaft, as viewed from the front of the receiver.

If an r-f assembly has been installed with the rotor improperly oriented, it is not necessary to remove the assembly for realignment of the rotor. Push the shaft through the properly aligned rotors, turn the shaft by rotating the entire band switch assembly until the previously engaged rotors agree with the one that is improperly oriented, engage this rotor, and return the shaft to the original angle to engage the remaining rotors.

Replacement of Receiver Panel Lamps. Two soldered-in lamps are used in the receiver. To replace these lamps, remove the bezel from the receiver front panel. Unsolder the defective lamp, and solder in the replacement. Replace the bezel.

Replacement of Semiconductors. The three crystal diodes contained in the Dynaverter are soldered directly into the circuit; their location and polarity are shown in Figure 5-13. When soldering or unsoldering a diode lead, use pliers to hold the lead between the solder joint and the diode. The pliers form a heat sink and prevent excessive heat from damaging the part. Do not remove the pliers until the heat from the solder joint has dissipated.

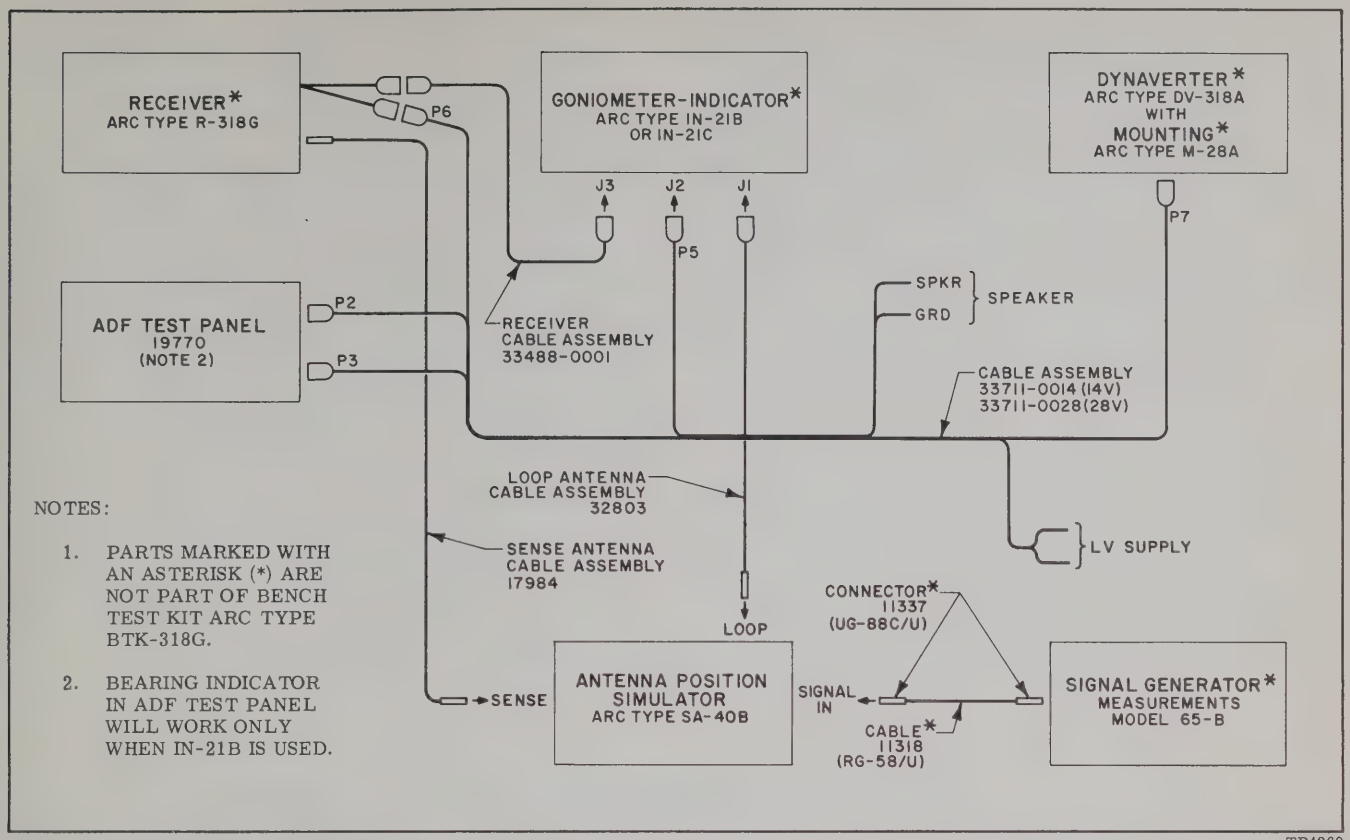
All transistors used in the Dynaverter are the plug-in type and can be extracted after removal of the two locknuts which secure the transistor in position.

4-4. DISASSEMBLY PROCEDURES.

To disassemble the goniometer-indicator, refer to the parts list at the end of this instruction book. Except for attaching parts which are listed after the part they attach, parts are listed in disassembly order. Reassembly is the reverse of disassembly. After reassembly, the alignment and adjustment procedures of paragraph 4-6 must be performed.

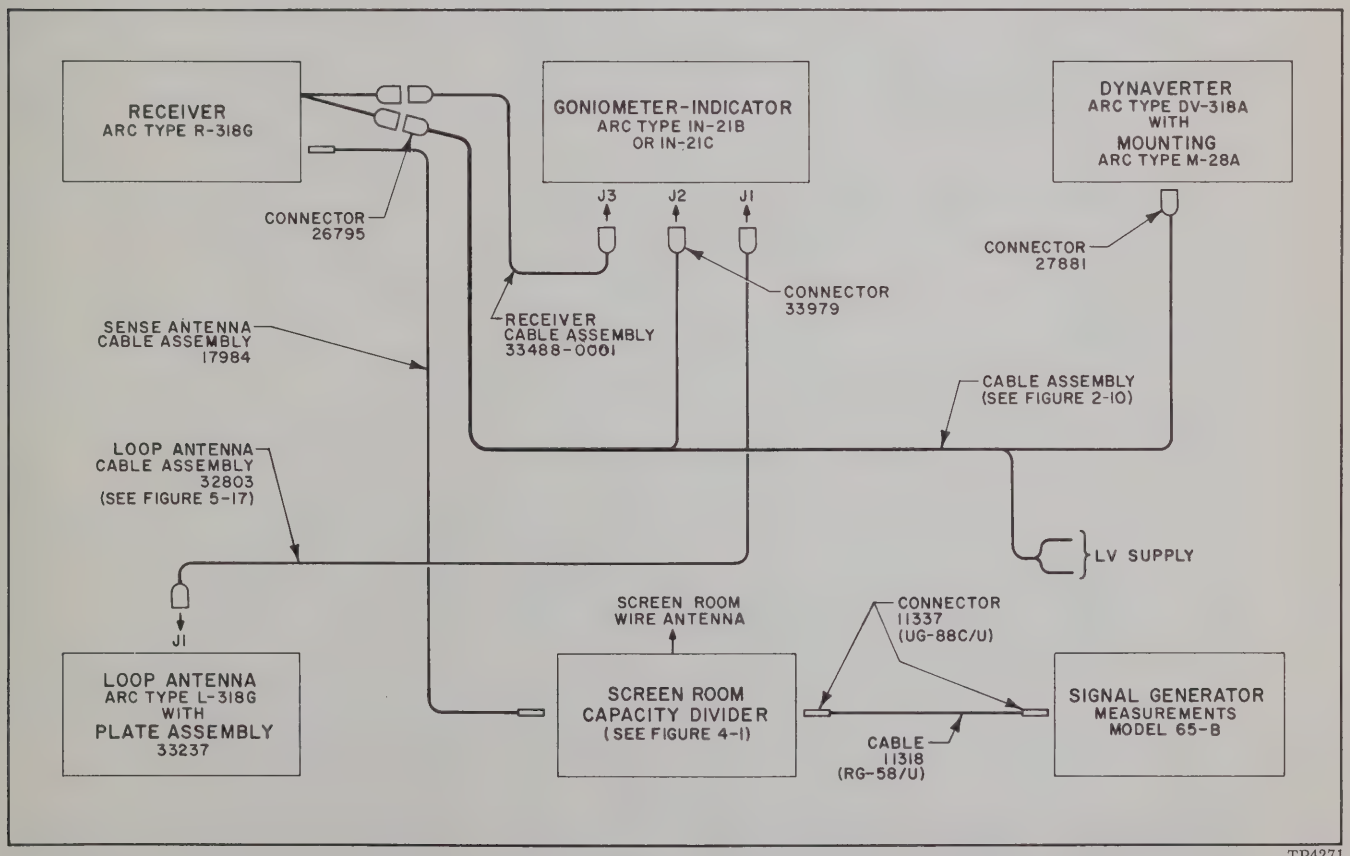
4-5. PERFORMANCE CHECKS.

General. Table 4-2 lists the procedures for checking the performance of the ADF set with or without the BTK-318G Bench Test Kit; unless noted otherwise, the procedures apply to either test setup. The individual checks may be performed separately if desired; however, if a unit has been realigned, all the checks must be performed. Unless otherwise noted, all controls, jacks, and indicators referred to in the table are located on the ADF Test Panel 19770 (supplied with BTK-318G). The test equipment required for performing the checks is listed in Table 4-1. Figure 4-8 illustrates the bench test setup using a BTK-318G Bench Test Kit. The bench test setup without the BTK-318G is shown in Figure 4-9.



TP4269

Figure 4-8. Bench Test Interconnection Diagram with ARC Type BTK-318G Bench Test Kit



TP4271

Figure 4-9. Bench Test Interconnection Diagram without ARC Type BTK-318G Bench Test Kit

Signal Source. The output of the signal generator is connected either to the SIG GEN receptacle on the antenna position simulator or to the input receptacle of the screen room capacitive line divider. When the FUNCTION switch of the antenna position simulator or screen room capacitive line divider is in the ANT position, the signal generator is fed through a 50-pf capacitor to the 100-pf sense antenna cable assembly. In the LOOP COMP or COMP position, the signal generator is coupled to the sense antenna cable assembly to provide 1/4-meter antenna effective height and also to feed one of two wire radiators which supply the signal source for the loop antenna. The BEARING switch of the antenna position simulator determines which wire radiator is used. Since the goniometer-indicator may be internally wired for different loop and sense antenna locations, the goniometer-indicator pointer may not indicate the bearing selected by the BEARING switch. Compare the internal wiring of the goniometer-indicator under test with the table in Figure 2-10 to determine the antenna positions for which the goniometer-indicator is wired. The correct pointer indications for the different antenna locations are as follows:

BEARING Switch	Top Loop		Bottom Loop	
	Top Sense	Bottom Sense	Top Sense	Bottom Sense
0°	180°	0°	0°	180°
90°	90°	270°	90°	270°

The LOOP COMP position of the antenna position simulator FUNCTION switch also provides direct conversion of signal generator microvolts to microvolts/meter field strength. The COMP position of the capacitive line divider, when used in a calibrated screen room, provides conversion of signal generator microvolts/meter field strength, but the microvolt output of the signal generator must be divided by the "room factor" to obtain the microvolts/meter field strength at the antenna input to the receiver. In the ANT position, the microvolt output of the signal generator is used directly.

Audio Output. A 300-ohm resistive load must be connected across the receiver audio output terminals (TEL). Equipment used in parallel with the audio output must have a high impedance in order not to affect the output measurements.

TABLE 4-2. PERFORMANCE CHECKS

Step	Procedure	Normal Indications
	PRELIMINARY PROCEDURE	
1	With BTK-318G: Interconnect units of 318G ADF and test equipment as shown in Figure 4-8. Without BTK-318G: Interconnect 318G ADF and test equipment as shown in Figure 4-9.	None.
2	Apply power to units by rotating receiver VOLUME control clockwise. Adjust primary power supply to 13.75 or 27.5 volts dc, depending on voltage rating of equipment. Allow units to warm up for at least 30 minutes.	None.
3	Prepare Measurements Model 65-B Signal Generator for operation.	None.
	VOLTAGE AMPLITUDE AND FREQUENCY	
1	Perform Steps 1 and 2 of the preliminary procedure outlined in this table.	None.
2	With BTK-318G: Set meter switch to LV and receiver function switch to COMP. Without BTK-318G: Set receiver function switch to COMP. Remove dust cover from Dynaverter. Connect Hewlett-Packard Model 410B vtvm between terminal 18 of J701 and ground.	Meter reads 13.75 or 27.5 volts dc.
3	With BTK-318G: Set meter switch to HV1. Without BTK-318G: Connect 410B between terminal 1 of J701 and ground.	Meter reads between 135 and 150 volts dc.
4	With BTK-318G: Set meter switch to HV2. Without BTK-318G: Connect 410B between terminal 2 of J701 and ground.	Meter reads between 115 and 125 volts dc.

TABLE 4-2. PERFORMANCE CHECKS - Continued

Step	Procedure	Normal Indications
	VOLTAGE AMPLITUDE AND FREQUENCY - Continued	
5	With BTK-318G: Set meter switch to 100~. Without BTK-318G: Connect 0-20 volt, a-c meter (rectifier type) between terminal 19 of J701 and ground.	Meter reads between 12 and 14 volts ac.
6	With BTK-318G: Connect 0-20 volt a-c meter (rectifier type) between GRD and Ø2 jacks. Press receiver TEST switch while observing a-c meter. Without BTK-318G: Connect 0-20 volt a-c meter (rectifier type) between terminal 6 of J701 on Dynaverter and ground. Press LOOP switch while observing a-c meter.	Meter reads approximately 40 volts ac.
7	With BTK-318G: Observe frequency meter. Without BTK-318G: Connect 94-116 cps, 10-15 volt frequency meter between terminal 19 of J701 on Dynaverter and ground.	Frequency meter reads 100 cps.
	MINIMUM NOISE LEVEL	
1	Perform Steps 1 and 2 of preliminary procedure outlined in this table.	None.
2	With BTK-318G: Connect Ballantine Model 300D vtvm, with 300-ohm resistor across input, to either TEL jack. Without BTK-318G: Connect Ballantine Model 300D vtvm, with 300-ohm resistor across input, between terminal 5 of P2 on receiver and ground.	None.
3	With BTK-318G: Set meter switch to TEL JKS, receiver function switch to ANT, and receiver VOLUME control to full counterclockwise (minimum) position, and receiver audio level to full clockwise (maximum) position. Without BTK-318G: Set receiver function switch to ANT, receiver VOLUME control to full counterclockwise (minimum) position, and receiver audio level (R139) to full clockwise (maximum) position.	Meter reads less than 400 mv (equivalent to .005 mw).
	MCW (ANT) SENSITIVITY[1]	
1	Perform preliminary procedure outlined in this table.	None.
2	With BTK-318G: Connect Ballantine Model 300D vtvm, with 300-ohm resistor across input, to either TEL jack. If desired, a high-impedance headset may be connected in parallel with the voltmeter. Without BTK-318G: Connect Ballantine Model 300D vtvm, with 300-ohm resistor across input, between terminal 5 of P2 on receiver and ground.	None.
3	With BTK-318G: Set meter switch to TEL JKS, antenna position simulator function switch to ANT, receiver function switch to ANT, and receiver band switch to 190—400. Without BTK-318G: Set screen room and receiver function switches to ANT and receiver band switch to 190—400.	None.

[1]MCW ANT sensitivity is defined as the signal input level, modulated 30 per cent at 1000 cps, fed in series with a 50-pf capacitance to the 100-pf sense antenna cable, required to produce a 6-db S+N/N ratio at 50 mw S+N (modulation on, modulation off; 50 mw is equal to 3.88 volts across 300 ohms).

TABLE 4-2. PERFORMANCE CHECKS - Continued

Step	Procedure	Normal Indications
	MCW (ANT) SENSITIVITY - Continued	
4	Tune receiver to 380 kc.	None.
5	Set Measurements Model 65-B Signal Generator output to 10 μv, modulated 30 per cent, 1000 cps.	None.
6	Tune 65-B in vicinity of 380 kc for maximum audio output as indicated on 300D. Adjust receiver VOLUME control to produce 3.88 volts output.	None.
7	Turn modulation off and read 300D.	If output is more than 6 db below 3.88 volts (less than 1.94 volts), sensitivity is better than 10 μv.
8	Set receiver band switch and tune receiver and 65-B to frequencies specified, repeating Steps 5, 6, and 7 for each frequency.	As noted in Step 7.
	COMPASS SENSITIVITY	
1	Perform preliminary procedure outlined in this table.	None.
2	Set receiver band switch to 190—400 and tune receiver to 210 kc.	None.
3	With BTK-318G: Set motor switch on, antenna position simulator function switch to LOOP COMP, and receiver function switch to COMP. Without BTK-318G: Set screen room and receiver function switches to COMP.	None.
4	Set Measurements Model 65-B Signal Generator output to 10,000 μv (10,000 μv/meter field strength), with no modulation.	None.
5	Tune 65-B in vicinity of 210 kc for maximum tuning meter deflection.	Goniometer-indicator nulls.
6	Rotate goniometer-indicator VAR. knob until pointer is at dial 0° position.	If goniometer-indicator is compensated, dial 0° position and pointer may not align with goniometer-indicator index.
7	Set 65-B output to 25 μv (25 μv/meter signal strength) with no modulation and tune 65-B in vicinity of 210 kc for maximum tuning meter deflection.	Goniometer-indicator reads 0 ±2° with ±2° jitter.
8	Set 65-B output to 10,000 μv. Note average reading of goniometer-indicator pointer jitter.	Goniometer-indicator reads 0 ±2° with ±1/2° jitter.

Step 8 — Frequencies:

Band Switch	Receiver	65-B
400—840	800	800
840—1750	1650	1650
190—400	300	300
400—840	620	620
840—1750	1300	1300
190—400	210	210
400—840	450	450
840—1750	950	950

TABLE 4-2. PERFORMANCE CHECKS - Continued

Step	Procedure	Normal Indications
	COMPASS SENSITIVITY - Continued	
9	Set 65-B output to 25 μv. Push receiver TEST switch to rotate goniometer-indicator pointer 175° clockwise from null. Release TEST switch and, using stop watch, note time (in seconds) for pointer to return within 2° of null.	Goniometer-indicator pointer returns in 9 seconds or less. If the goniometer has been compensated, pointer may slow up, speed up, or both, while it is traveling toward 0°, which is normal. To check that pointer mechanism is not defective, press receiver TEST switch to see that pointer rotates smoothly when slewed away from null.
10	Set receiver band switch and tune receiver and 65-B to frequencies specified, repeating Steps 7, 8, and 9 for each frequency. Band Switch — Receiver — 65-B 400—840 — 450 — 450 840—1750 — 950 — 950 190—400 — 380 — 380 400—840 — 800 — 800 840—1750 — 1650 — 1650	As noted in Steps 7, 8, and 9.
	SELECTIVITY	
1	Perform preliminary procedure outlined in this table.	None.
2	With BTK-318G: Connect Ballantine Model 300D vtvm, with 300-ohm resistor across input, to either TEL jack. Set meter switch to TEL JKS. Without BTK-318G: Connect Ballantine Model 300D vtvm, with 300-ohm resistor across input, between terminal 5 of P2 on receiver and ground.	None.
3	With BTK-318G: Set antenna position simulator function switch to ANT, receiver function switch to ANT, and receiver band switch to 840—1750. Without BTK-318G: Set screen room and receiver function switches to ANT and receiver band switch to 840—1750.	None.
4	Tune receiver to 1700 kc.	None.
5	Set Measurements Model 65-B output to 50 μv, modulated 30 per cent, 1000 cps.	None.
6	Tune 65-B in vicinity of 1700 kc for maximum audio output as indicated by 300D. Adjust receiver VOLUME control to produce 3.88 volts output.	None.
7	Increase 65-B output to 100 μv. Set 65-B frequency above resonance to the point where the output (as read on 300D) equals 3.88 volts. Record this frequency. Repeat the procedure below resonance and record this frequency.	Difference between two frequencies (6 db bandwidth) is between 8.0 and 10.0 kc.
8	Increase 65-B output to 50,000 μv and repeat Step 7.	Difference between two frequencies (60 db bandwidth) is between 29 and 34 kc.
9	Set receiver band switch to 190—400 and tune receiver to 210 kc.	None.

TABLE 4-2. PERFORMANCE CHECKS - Continued

Step	Procedure	Normal Indications
	SELECTIVITY - Continued	
10	Repeat Steps 5 and 6 except tune 65-B in vicinity of 210 kc.	None.
11	Repeat Step 7.	Difference between two frequencies (6 db bandwidth) is between 6.6 and 8.2 kc.
12	Increase 65-B output to 50,000 μv and repeat Step 7.	Difference between two frequencies (60 db bandwidth) is between 18.2 and 22.2 kc.
	AVC TEST	
1	Perform preliminary procedure outlined in this table.	None.
2	With BTK-318G: Connect Ballantine Model 300D vtvm, with 300-ohm resistor across input, to either TEL jack. Without BTK-318G: Connect Ballantine Model 300D vtvm, with 300-ohm resistor across input, between terminal 5 of P2 on receiver and ground.	None.
3	Set receiver band switch to 190—400 and tune receiver to 210 kc.	None.
4	With BTK-318G: Set receiver function switch to COMP and antenna position simulator function switch to LOOP COMP. Without BTK-318G: Set screen room and receiver function switches to COMP.	None.
5	Set Measurements Model 65-B Signal Generator output to 100 μv modulated 30 per cent at 1000 cps. Tune 65-B in vicinity of 210 kc for maximum tuning meter deflection. Set receiver audio level set (R139) to full clockwise (maximum) position. Adjust receiver VOLUME control to produce 3.88 volts output as indicated by 300D.	None.
6	Set 65-B output to 10 μv.	300D reads between 2.5 and 4.5 volts.
7	Set 65-B output to 100 μv.	300D reads between 3.82 and 3.94 volts.
8	Set 65-B output to 100,000 μv.	300D reads between 4.5 and 6.5 volts.
9	Set 65-B output to 500,000 μv.	300D reads less than 8.0 volts.
10	Set receiver band switch to 400—840 and tune receiver to 450 kc. Repeat Steps 2 through 9.	As noted in Steps 2 through 9.
11	Set receiver band switch to 840—1750 and tune receiver to 950 kc. Repeat Steps 2 through 9.	As noted in Steps 2 through 9 except that at 10 μv 300D reads between 1.8 and 3.0 volts, and at 100,000 μv 300D reads between 5.0 and 7.0 volts.
	POWER OUTPUT TEST	
1	Perform preliminary procedure outlined in this table.	None.

TABLE 4-2. PERFORMANCE CHECKS - Continued

Step	Procedure	Normal Indications
	POWER OUTPUT TEST - Continued	
2	With BTK-318G: Connect Ballantine Model 300D vtvm, with 300-ohm resistor across input, to either TEL jack. Without BTK-318G: Connect Ballantine Model 300D, with 300-ohm resistor across input, between terminal 5 of P2 on receiver and ground.	None.
3	With BTK-318G: Set receiver band switch to 840—1750 and tune receiver to 950 kc. Set receiver function switch to COMP and antenna position simulator function switch to LOOP COMP. Set meter switch to TEL JKS. Without BTK-318G: Set receiver band switch to 840—1750 and tune receiver to 950 kc. Set screen room and receiver function switches to COMP.	None.
4	Set Measurements Model 65-B Signal Generator output to 100 μv modulated 30 per cent at 1000 cps. Tune 65-B in vicinity of 950 kc for maximum tuning meter deflection.	None.
5	Set receiver VOLUME control and audio level set to extreme clockwise (maximum) positions and note audio output as indicated on 300D.	300D reads between 10 and 15 volts.
	LOW-VOLTAGE OPERATIONAL TEST	
1	Perform preliminary procedure outlined in this table.	None.
2	With BTK-318G: Connect Ballantine Model 300D vtvm, with 300-ohm resistor across input, to either TEL jack. Without BTK-318G: Connect Ballantine Model 300D vtvm, with 300-ohm resistor across input, between terminal 5 of P2 on receiver and ground.	None.
3	With BTK-318G: Set receiver function switch to ANT, receiver band switch to 190—400, and tune receiver to 210 kc. Set antenna position simulator function switch to ANT. Adjust primary voltage to 11.0 volts dc (for 14-volt units) or 22.0 volts dc (for 28-volt units). Set meter switch to TEL JKS. Without BTK-318G: Set screen room and receiver function switches to ANT. Set receiver band switch to 190—400 and tune receiver to 210 kc. Adjust primary voltage to 11.0 volts dc (for 14-volt units) or 22.0 volts dc (for 28-volt units).	None.
4	Set Measurements Model 65-B Signal Generator output to 10 μv modulated 30 per cent at 1000 cps. Tune 65-B in vicinity of 210 kc for maximum audio output as indicated by 300D. Adjust receiver VOLUME control to produce 2.0 volts.	None.
5	Turn modulation off and read 300D.	300D reads 1.0 volt or less.
6	Set receiver band switch, and tune receiver and 65-B to frequencies specified, repeating Steps 3, 4, and 5. Band Switch / Receiver / 65-B 400—840 / 450 / 450 840—1750 / 950 / 950	As noted in Steps 3, 4, and 5.

4-6. ALIGNMENT AND ADJUSTMENT.

Receiver and Dynaverter. Table 4-3 lists the procedures for aligning the receiver and Dynaverter, with or without the BTK-318G Bench Test Kit; unless noted otherwise, the procedures apply to either test setup. Though specific alignment procedures are identified by subtitles, they should not be performed individually; each procedure presupposes that all previous steps have been completed. The test equipment and accessories required for alignment and adjustment of the units are listed in Table 4-1. The bench test setup using a BTK-318G Bench Test Kit is shown in Figure 4-8. The bench test setup without a BTK-318G is shown in Figure 4-9. Except for R139, audio level set, in the receiver and R706, 100-cps adjustment, in the Dynaverter, the alignment points referred to in the table are shown in Figure 4-10. The standard test conditions described in paragraph 4-5 are applicable. Unless otherwise noted, all controls and indicators referred to in the table are located on the ADF Test Panel 19770 (supplied with the BTK-318G).

Note

The receiver and Dynaverter are aligned at the factory. Do not realign unless it is evident such action is required. If a unit is realigned, all the test procedures of Table 4-2 must be performed to check the accuracy of alignment.

TABLE 4-3. RECEIVER AND DYNAVERTER ALIGNMENT AND ADJUSTMENT

Step	Procedure
	PRELIMINARY PROCEDURE
1	With BTK-318G: Interconnect 318G ADF and test equipment as shown in Figure 4-8. Without BTK-318G: Interconnect 318G ADF and test equipment as shown in Figure 4-9.
2	Apply primary power to units by rotating receiver VOLUME control clockwise. Adjust output of primary power supply to 13.75 or 27.5 volts dc, depending on voltage rating of equipment. Allow units to warm up for at least 30 minutes.
3	Prepare Measurements Model 65-B Signal Generator for operation.
	DYNAVERTER 100-CPS OSCILLATOR ALIGNMENT
4	With BTK-318G: Adjust R706 in the Dynaverter until frequency meter indicates 100 cps. Without BTK-318G: Connect 94-116 cps, 10-15 volt frequency meter between terminal 19 of J701 and ground. Adjust R706 in Dynaverter until frequency meter indicates 100 cps.
	RECEIVER TRIMMER CAPACITOR ALIGNMENT
5	Set 65-B output to exactly 380 kc. Use Measurements Model 111-B Crystal Calibrator to check frequency.
6	With BTK-318G: Set receiver function switch to COMP and band switch to 190—400. Set LOOP MOTOR ON-OFF switch OFF. Set antenna position simulator function switch to LOOP COMP. Without BTK-318G: Set screen room and receiver function switch to COMP. Set receiver band switch to 190—400. Disconnect Connector 33979 shown in Figure 4-9.
7	Tune receiver to 380 kc.
8	Set 65-B output to approximately 10,000 μv. Adjust in order C141, C130, C125, and C119 for maximum deflection of the receiver tuning meter.
9	Set 65-B output to 20 μv. Readjust in order C141, C130, C125, and C119 for maximum deflection of receiver tuning meter.
10	Set 65-B to exactly 800 kc. Set receiver band switch to 400—840. Do not change tuning of receiver.
11	Set 65-B output to approximately 10,000 μv. Adjust in order C142, C131, C126, and C120 for maximum deflection of receiver tuning meter.
12	Set 65-B output to 20 μv. Readjust in order C142, C131, C126, and C120 for maximum deflection of receiver tuning meter.

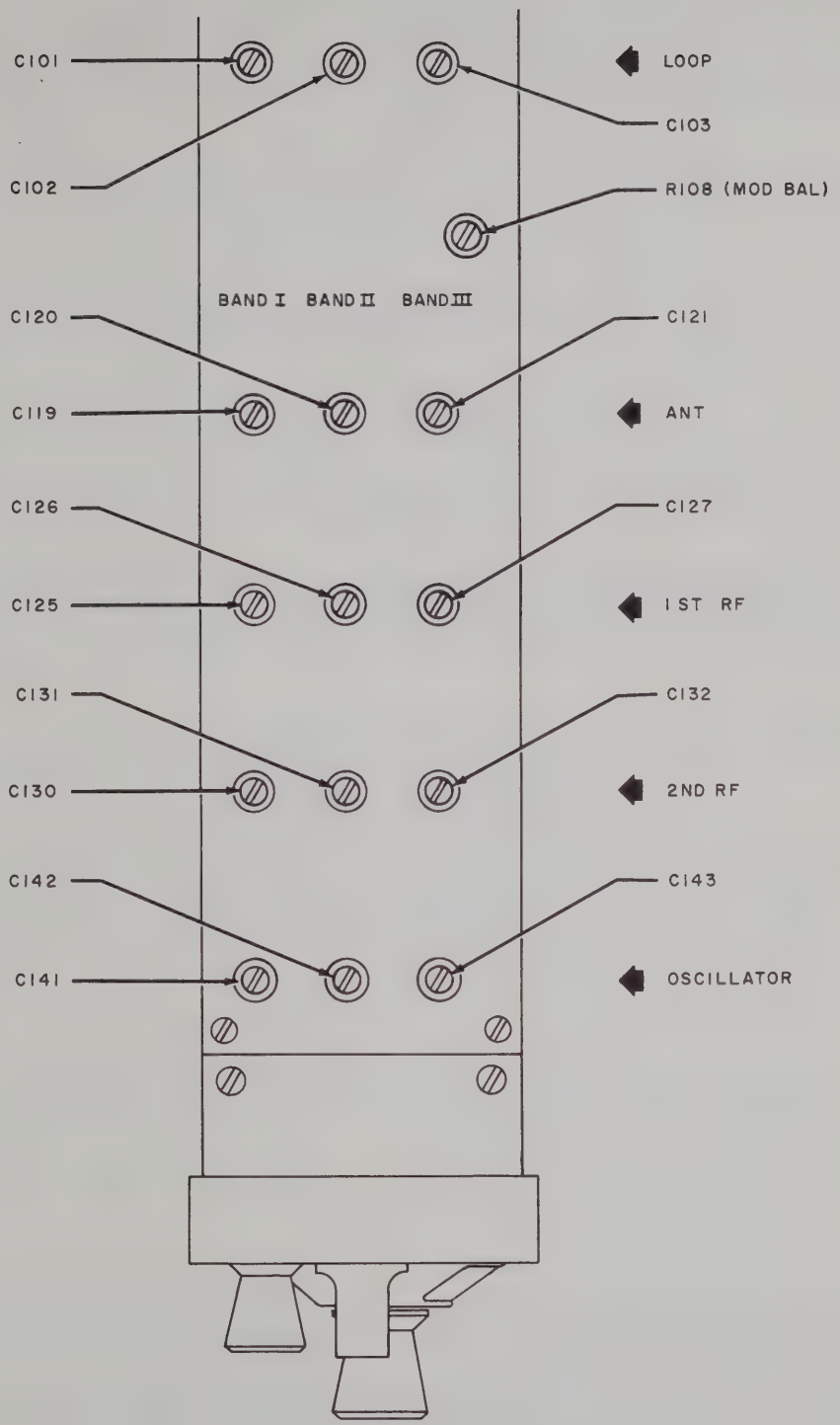


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Figure 4-10. R-318G Receiver, Alignment Points

TABLE 4-3. RECEIVER AND DYNAVERTER ALIGNMENT AND ADJUSTMENT - Continued

Step	Procedure
	RECEIVER TRIMMER CAPACITOR ALIGNMENT - Continued
13	Set 65-B to 1650 kc. Set receiver band switch to 840—1750 and tune receiver to 1650 kc.
14	Set 65-B output to approximately 10,000 μv. Adjust in order C143, C132, C127, and C121 for maximum deflection of receiver tuning meter.
15	Set 65-B output to 20 μv. Readjust in order C143, C132, C127, and C121 for maximum deflection of receiver tuning meter. Note Without BTK-318G: After Step 15 is completed, reconnect Connector 33979 shown in Figure 4-9.
	RECEIVER LOOP AMPLIFIER ALIGNMENT
16	Set receiver function switch to COMP and set receiver band switch to 190—400.
17	Rotate goniometer-indicator VAR. knob until pointer is at dial 0° position.
18	With BTK-318G: Set antenna position simulator function switch to LOOP COMP. Set LOOP MOTOR switch ON, press LOOP switch to rotate goniometer rotor either 10° or 350° as read on goniometer-indicator. Quickly release LOOP switch and set LOOP MOTOR switch off. Note It is necessary to set the LOOP MOTOR switch OFF quickly to prevent the goniometer rotor from returning to the 0° (null) position. Without BTK-318G: Set screen room and receiver function switches to COMP. Press receiver TEST switch to rotate goniometer rotor to either 10° or 350° as read on goniometer-indicator. Quickly release TEST switch and disconnect Connector 33979 shown in Figure 4-9. Note It is necessary to disconnect the connector quickly to prevent the goniometer rotor from returning to the 0° (null) position.
20	Set 65-B to exactly 380 kc.
21	Set 65-B output to 10,000 μv with no modulation.
22	Tune receiver to 380 kc.
23	With BTK-318G: Set meter switch to TEL 300 ω. Adjust receiver VOLUME control to provide a 0.5-volt reading on meter. Without BTK-318G: Connect Ballantine Model 300D vtvm, with 300-ohm resistor across input, between terminal 5 of P2 on the receiver and ground. Adjust receiver VOLUME control for 0.5-volt indication on meter.
24	Adjust C101 for maximum output on meter. If output exceeds 10.0 volts, decrease receiver VOLUME control to prevent overloading.
25	Set 65-B to 800 kc. Set receiver band switch to 400—840; do not change tuning of receiver. Adjust receiver VOLUME control to provide 0.5-volt reading on the meter. Adjust C102 for maximum output.

TABLE 4-3. RECEIVER AND DYNAVERTER ALIGNMENT AND ADJUSTMENT - Continued

Step	Procedure
	RECEIVER LOOP AMPLIFIER ALIGNMENT - Continued
26	Set 65-B to exactly 1650 kc. Set receiver band switch to 840—1750. Tune receiver to 1650 kc and adjust receiver VOLUME control to provide a 0.5-volt reading on meter. Adjust C103 for maximum output. Note Without BTK-318G: When Step 25 is completed, reconnect Connector 33979 shown in Figure 4-9.
	RECEIVER BALANCED MODULATOR ADJUSTMENT
27	Set receiver band switch to 190—400 and tune receiver to 380 kc. Make certain no signal is being received; detune slightly if necessary.
28	With BTK-318G: Set receiver function switch to COMP. Set LOOP MOTOR switch on and antenna position simulator function switch to LOOP COMP. Without BTK-318G: Set screen room and receiver function switches to COMP.
29	With no output from 65-B, adjust receiver MOD BAL potentiometer R108 for minimum rotational speed of goniometer rotor.
30	Set receiver band switch to 400—840; do not change tuning of receiver, and note speed of goniometer rotor rotation. Set receiver band switch to 840—1750 and tune receiver to 1650 kc. Note speed of goniometer rotor rotation. Make certain no signal is being received in either band position; detune slightly if necessary.
31	Reset receiver MOD BAL potentiometer R108 for minimum rotation on all bands. Under no-signal conditions, goniometer rotor should not rotate faster than 180° in 30 seconds on any band.
	AUDIO LEVEL SET
32	Set receiver function switch to ANT, band switch to 190—400, and tune to 380 kc.
33	Set receiver VOLUME control to full clockwise position.
34	Adjust receiver audio level set (R139) to provide a 50-mv reading on meter.

Goniometer-Indicator. If the goniometer-indicator has been disassembled, the following alignment procedure must be performed. Alignment and adjustment points for the goniometer-indicator are shown in Figure 4-11. A bench test interconnection diagram for alignment of the goniometer-indicator is shown in Figure 4-12.

Step 1. Set all compensation adjustment screws to their maximum counterclockwise positions (minimum compensation). Using VAR. control, set 0° on dial under index. Using goniometer drive gear, set cam follower over the 45° compensation adjustment screw and goniometer dial to 45°. Note the pointer reading.

Step 2. Set 45° compensation adjustment screw to its maximum clockwise position (maximum compensation). Note pointer reading. Compute the total range of compensation by obtaining difference between pointer reading of this step and Step 1. Divide difference (at least 50°) by 2 and add resultant figure to pointer reading. This figure is mid-range of 45° compensation adjustment screw.

Step 3. Set 45° compensation adjustment screw to mid-range point.

Note

To prevent damage to the cam follower track, adjust the adjacent compensation adjustment screws so that the cam follower track is sloped.

If necessary, realign cam follower over 45° compensation adjustment screw. Next, align fiducial mark and 45° position on goniometer dial by loosening the screws securing the fiducial bracket in position, adjusting the fiducial bracket, and then tightening the screws.

Step 4. Interconnect goniometer-indicator and test equipment as shown in Figure 4-12.

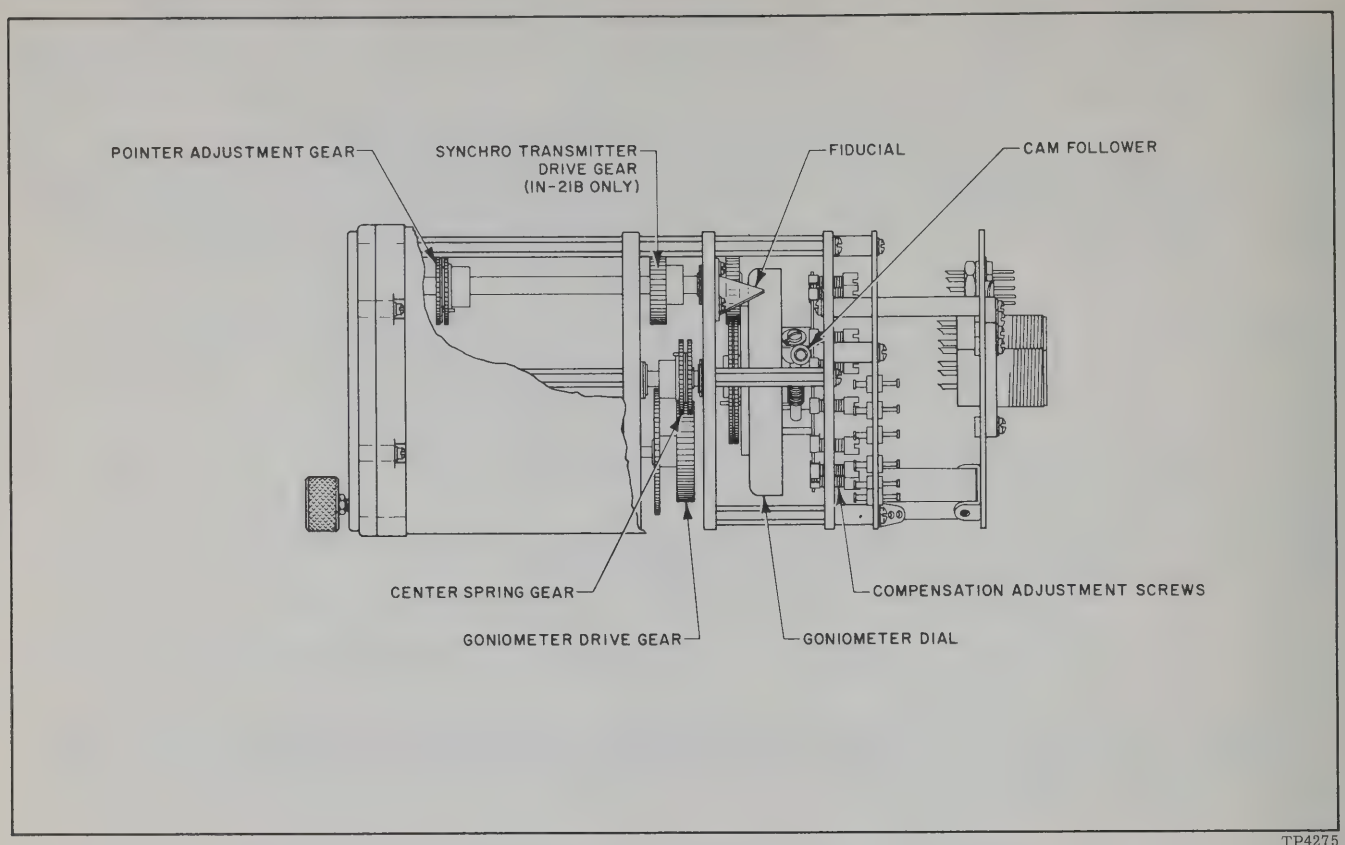


Figure 4-11. IN-21B and IN-21C Goniometer-Indicator, Alignment Points

Step 5. Set Measurements Model 65-B Signal Generator output for 100,000 cps, 2 volts. Set Hewlett-Packard Model 200AB Audio Oscillator output for 400 cps, 26 volts. Adjust Tektronix Model 310 Oscilloscope for suitable presentation.

Step 6. Rotate goniometer drive gear until horizontal line is observed on 310. This is a null position of which there are two. To determine correct null position, rotate the goniometer dial and observe horizontal line of the 310; it should rotate in same direction as goniometer dial.

Step 7. Adjust goniometer dial in vicinity of correct null for minimum voltage as read on Boonton Electronics Model 91C R-f Voltmeter.

Note

Do not allow gear train or goniometer to rotate.

Step 8. Loosen the setscrews securing center spring gear and align 45° mark on goniometer dial with fiducial mark. Tighten setscrews.

Step 9. Loosen the setscrews securing pointer adjustment gear and align pointer with 45° index. Tighten setscrews.

Step 10. Repeat Steps 6 through 9 until maximum accuracy of alignment is obtained.

Step 11. Rotate goniometer drive gear until 75° mark on goniometer dial is aligned with fiducial. Adjust the 75° compensation adjustment screw until the pointer indicates 75°. Repeat this step at each compensation point in a numerically increasing sequence.

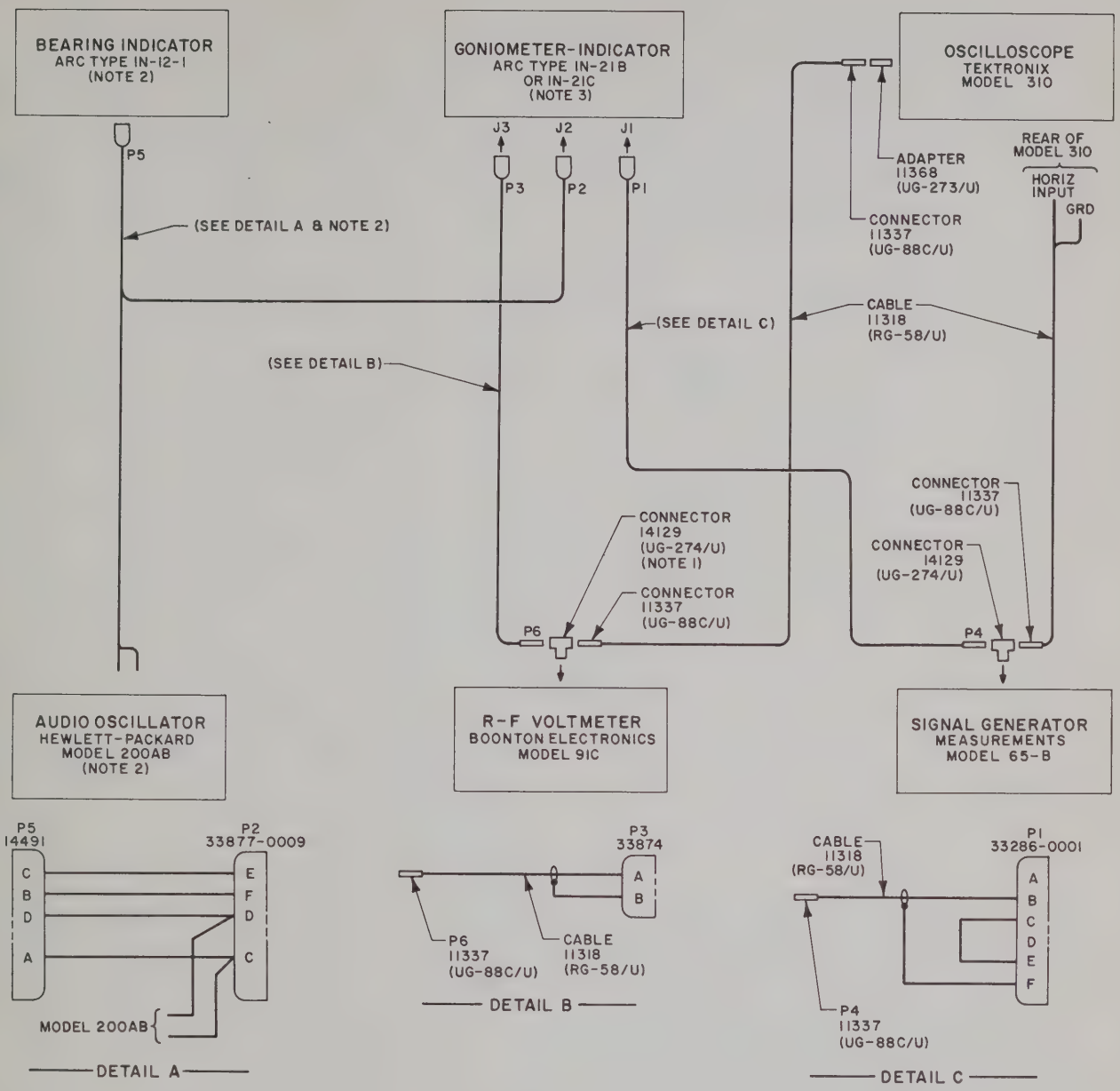
CAUTION

Do not force compensation adjustment screws. If correct pointer reading cannot be obtained, go on to next compensation adjustment screw, adjust, and then return.

Step 12. If aligning IN-21B Goniometer-Indicator, loosen setscrews securing synchro transmitter drive gear and adjust synchro transmitter spring gear until IN-12-1 Bearing Indicator pointer reading is the same as the goniometer-indicator pointer reading.

4-7. MEASUREMENTS.

Figure 4-13 illustrates the voltage and resistance measurements for the receiver tube terminals. Resistance measurements for both goniometer-indicators are given in Table 4-4. Dynaverter operating voltages are given in Table 4-5.



NOTES:

1. USE BNC ADAPTER SUPPLIED WITH MODEL 91C.
2. USED ONLY FOR ALIGNMENT OF IN-21B GONIOMETER-INDICATOR.
3. GONIOMETER-INDICATOR MUST BE WIRED FOR TOP SENSE ANTENNA AND BOTTOM LOOP ANTENNA LOCATIONS.

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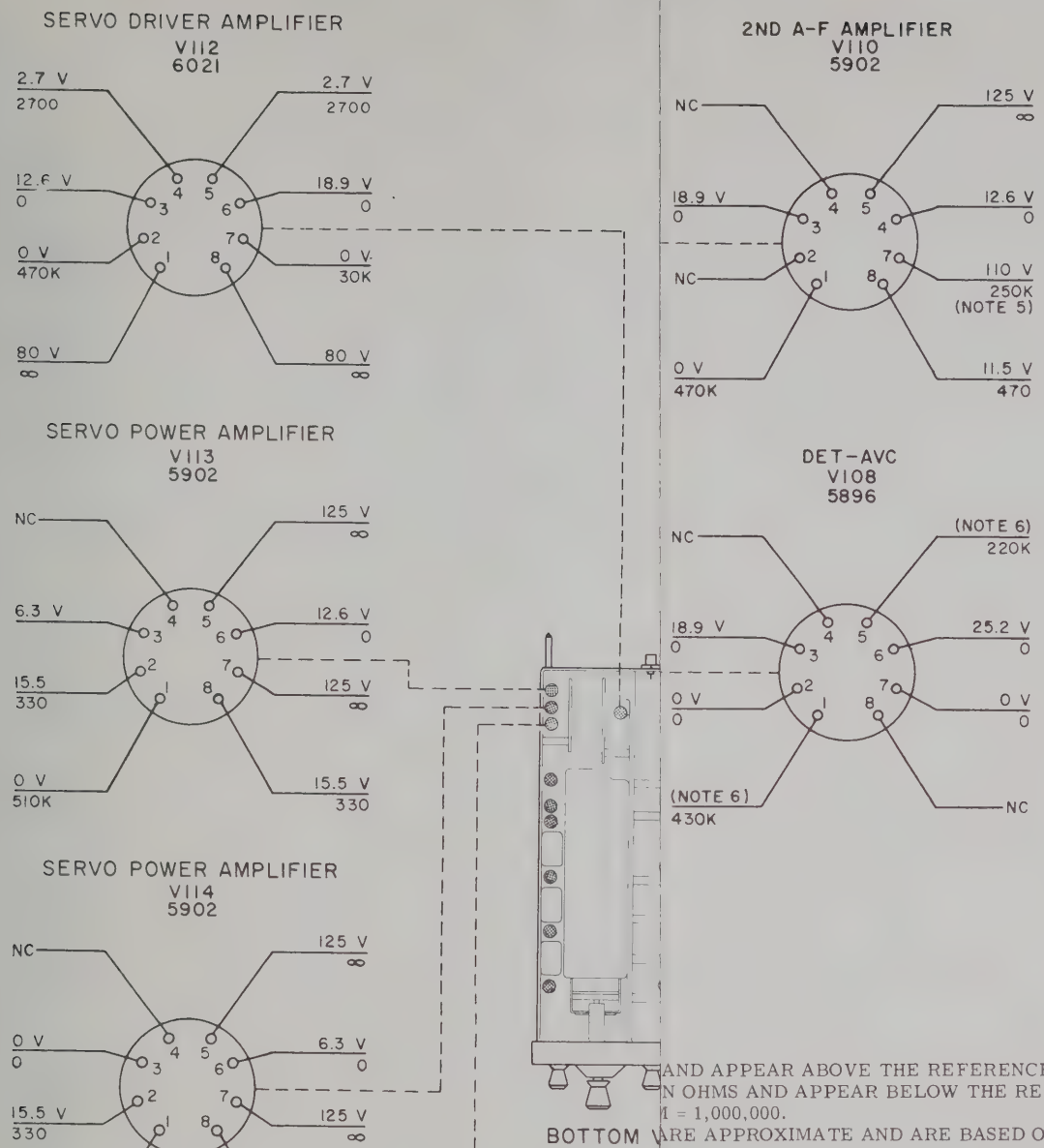
Figure 4-12. Bench Test Interconnection Diagram for Goniometer-Indicator Alignment



AND APPEAR ABOVE THE REFERENCE LINE.
N OHMS AND APPEAR BELOW THE REFERENCE LINE. MULTI-
1 = 1,000,000.
ARE APPROXIMATE AND ARE BASED ON THE FOLLOWING CONDI-

ARE WITH RESPECT TO CHASSIS GROUND.
DC MEASURED AT TERMINAL 18 OF J701 ON DV-318A.
PER-VOLT VOLTMETER USED FOR ALL MEASUREMENTS.
WITCH IN COMP POSITION AND VOLUME CONTROL IN MAXIMUM

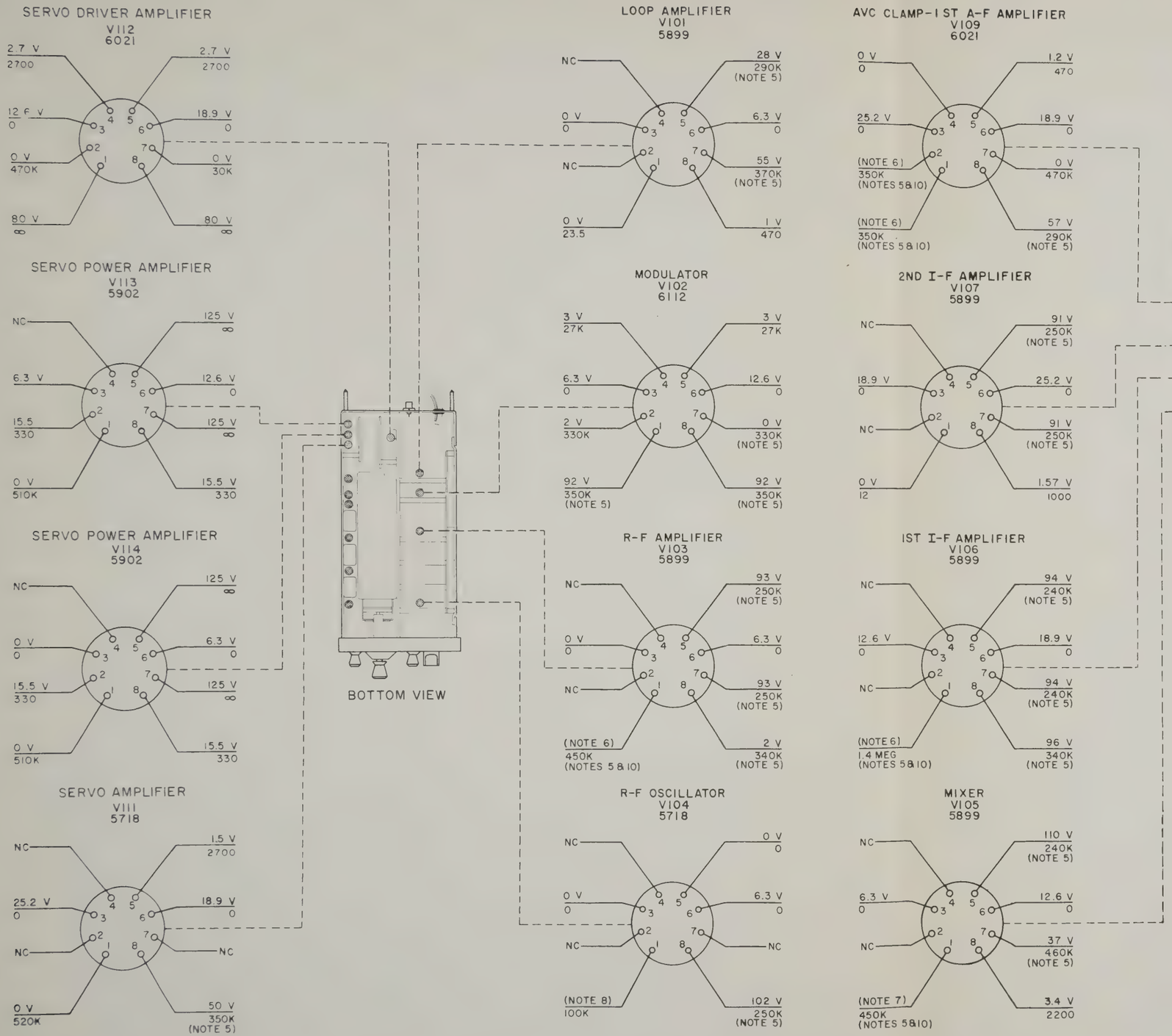
UNING CAPACITOR FULLY MESHED (MAXIMUM CAPACITANCE).
S ARE APPROXIMATE AND ARE BASED ON THE FOLLOWING CON-

DISCONNECTED FROM RECEIVER.
ERMINAL OF OHMMETER GROUNDED TO CHASSIS, UNLESS OTHER

H IN .19--.40 MC POSITION (BAND I).
±25% IN NORMAL RECEIVERS BECAUSE OF LEAKAGE THROUGH
TORS.
OLTAGE NOT TO EXCEED -1 VOLT.
OLTAGE NOT TO EXCEED -3 VOLTS.
NT ON METER LEADS, BAND POSITION, AND TUNING CAPACITOR
E NOT TO EXCEED -7 VOLTS.
ONNECTION.
F OHMMETER AT GROUND POTENTIAL.

TP4279

Figure 4-13. R-318G Receiver, Voltage and Resistance Measurements



NOTES:

1. VOLTAGES ARE DC AND APPEAR ABOVE THE REFERENCE LINE.
2. RESISTANCES ARE IN OHMS AND APPEAR BELOW THE REFERENCE LINE. MULTIPLIERS: K = 1000, M = 1,000,000.
3. VOLTAGE VALUES ARE APPROXIMATE AND ARE BASED ON THE FOLLOWING CONDITIONS:
   (A) ALL VALUES ARE WITH RESPECT TO CHASSIS GROUND.
   (B) 27.5 VOLTS DC MEASURED AT TERMINAL 18 OF J701 ON DV-318A.
   (C) 20,000 OHMS-PER-VOLT VOLTMETER USED FOR ALL MEASUREMENTS.
   (D) FUNCTION SWITCH IN COMP POSITION AND VOLUME CONTROL IN MAXIMUM POSITION.
   (E) RECEIVER TUNING CAPACITOR FULLY MESHED (MAXIMUM CAPACITANCE).
4. RESISTANCE VALUES ARE APPROXIMATE AND ARE BASED ON THE FOLLOWING CONDITIONS:
   (A) ALL CABLES DISCONNECTED FROM RECEIVER.
   (B) NEGATIVE TERMINAL OF OHMMETER GROUNDED TO CHASSIS, UNLESS OTHER WISE NOTED.
   (C) BAND SWITCH IN .19--.40 MC POSITION (BAND I).
5. VALUES CAN VARY ±25% IN NORMAL RECEIVERS BECAUSE OF LEAKAGE THROUGH TANTALUM CAPACITORS.
6. SMALL NEGATIVE VOLTAGE NOT TO EXCEED -1 VOLT.
7. SMALL NEGATIVE VOLTAGE NOT TO EXCEED -3 VOLTS.
8. VOLTAGE DEPENDENT ON METER LEADS, BAND POSITION, AND TUNING CAPACITOR POSITION. VOLTAGE NOT TO EXCEED -7 VOLTS.
9. NC INDICATES NO CONNECTION.
10. POSITIVE PROBE OF OHMMETER AT GROUND POTENTIAL.

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Figure 4-13. R-318G Receiver, Voltage and Resistance Measurements

TABLE 4-4. GONIOMETER-INDICATOR RESISTANCE MEASUREMENTS

Note

Pin-to-pin or pin-to-ground measurements not included in table are infinite.

Conditions:

1. All cables disconnected.
2. Measurements made with Hewlett-Packard Model 410B vtvm.
3. Values are approximate (tolerance ±10%).
4. Values apply to both IN-21B and IN-21C, except where two values are stated, value in parentheses applies to IN-21B, the other to IN-21C.

From		To		Resistance	From		To		Resistance
Connector	Pin	Connector	Pin	(ohms)	Connector	Pin	Connector	Pin	(ohms)
J1	A	J1	D	0	J2	C	J2	D	(35) ∞
		J3	C	0				E	(10) ∞
	B	J1	E	1				F	(10) ∞
	C	J1	F	1				K	0
	D	J3	C	0			GRD		0
J2	A	J2	B	450		D	J2	E	(40) ∞
			C	35				F	(40) ∞
			D	(65) ∞				K	(30) ∞
			E	(45) ∞			GRD		(30) ∞
			F	(45) ∞		E	J2	F	(20) ∞
			K	35				K	(10) ∞
		GRD		35			GRD		(10) ∞
	B	J2	C	410		F	J2	K	(10) ∞
			D	(450) ∞			GRD		(10) ∞
			E	(420) ∞		K	GRD		0
			F	(420) ∞	J3	A	J3	B	1
			K	410				C	0
		GRD		410		B		C	0
						C	GRD		0

TABLE 4-5. DYNAVERTER OPERATING VOLTAGES

Conditions:

1. Voltage measurements are made with a 20,000 ohms-per-volt voltmeter such as Simpson Model 260 Multimeter.
2. D-c voltages are positive and are measured with respect to chassis ground. Except as noted, a-c voltages are measured with respect to chassis ground.
3. Voltages shown in parentheses are for 14-volt models.
4. Measurements are made with Dynaverter connected as shown in Figure 4-8 or 4-9.

Ref Desig	Test Point	D-c Volts	A-c Volts[1]
CR703	Anode	1.0 approx.	—
	Cathode	0	—
J701	Pin 1	125.0	—
	Pin 2	114.0 (110.0)	—
	Pin 7	—	13.0
	Pin 15	27.5 (13.75)	—
	Pin 18	27.5 (13.75)	—
	Pin 19	—	13.0
L701	Input	27.5 (13.75)	—
	Output	27.5 (13.75)	—
Q701	Emitter	25.0 (12.75)	0.35 (0.4)
	Base	26.75 (13.0)	0.5 (0.4)
	Collector	—	9.0 (4.1)
Q702	Emitter	25.0 (12.75)	0.35 (0.4)
	Base	26.75 (13.0)	0.5 (0.4)
	Collector	—	9.0 (4.1)
Q703	Emitter	25.5 (12.0)	18.0 (8.9)
	Base	26.4 (12.9)	19.0 (10.0)
	Collector	0	0
Q704	Emitter	25.5 (12.0)	18.0 (8.9)
	Base	26.4 (12.9)	19.0 (10.0)
	Collector	0	0
Q705	Emitter	26.3 (12.6)	—
	Base	26.5 (12.6)	—
	Collector	0.1 (0.1)	—
	Collector-base	—	1.05 (0.8)
	Collector-emitter	—	0.95 (0.65)
Q706	Emitter	26.3 (12.6)	—
	Base	26.5 (12.6)	—
	Collector	0.1 (0.1)	—
	Collector-base	—	1.07 (0.8)
	Collector-emitter	—	0.95 (0.6)

[1]Measure all a-c voltages (except those on pins 7 and 19) using a 0.1-μf d-c blocking capacitor; if a Simpson Model 260 is used, no external blocking capacitor is required, provided the meter function switch is set to OUTPUT.

SECTION V

DIAGRAMS

NOTES:

1. ASSOCIATED WIRING DIAGRAMS ARE A

SUBASSEMBLY
MAIN CHASSIS
LOOP AMPLIFIER
MODULATOR
ANTENNA ASSEMBLY
1ST R-F
2ND R-F
OSCILLATOR
I-F AND A-F AMPLIFIER
SERVO AMPLIFIER
SERVO DRIVER & POWER AMPL

2. INDUCTANCE VALUES ARE IN MICROH WISE NOTED.
3. CAPACITANCE VALUES ARE IN PICOF NOTED.
4. RESISTANCE VALUES ARE IN OHMS. M 1,000,000.
5. BAND SWITCH SECTIONS S101—S106 AI POSITION, UNLESS OTHERWISE NOTE AS VIEWED FROM THE FRONT OF TH TERMINALS IN THE SAME RELATIVE ARE ON A COMMON SHAFT. ANGULAR ALL BANDS. STATOR SECTORS ARE R A, B, AND C FOR THE FRONT SECTO TOR. STATOR SECTORS IN USE ARE A S102 - A, B, D; S103 - A, B; S104 - A, A, B, C, D.
6. THE INTERMEDIATE FREQUENCY (I-F QUENCY IS HIGHER THAN SIGNAL FRE
7. S107 SHOWN IN COMP POSITION.
8. C181 (3 OR 5 pF) INSTALLED IN SOME ADJUSTMENT.
9. VALUE OF R124 MAY BE CHANGED TO SATISFY SENSITIVITY CONTROL REQU

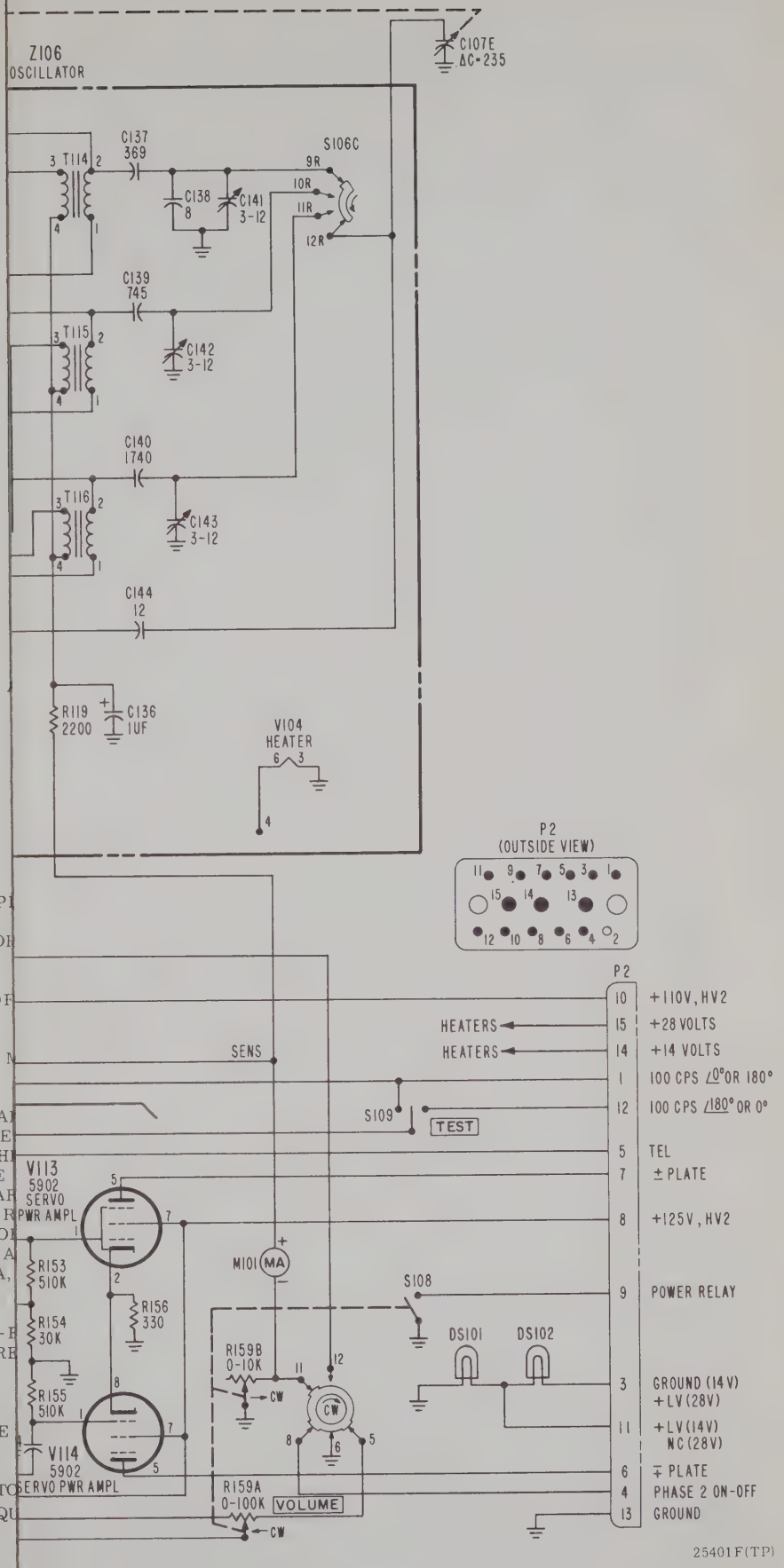


Figure 5-1. R-318G Receiver, Schematic Diagram

NOTES:

1. ASSOCIATED WIRING DIAGRAMS ARE AS FOLLOWS:

SUBASSEMBLY	FIGURE NO.
MAIN CHASSIS	5-2
LOOP AMPLIFIER	5-3
MODULATOR	5-4
ANTENNA ASSEMBLY	5-5
1ST R-F	5-6
2ND R-F	5-7
OSCILLATOR	5-8
I-F AND A-F AMPLIFIER	5-9
SERVO AMPLIFIER	5-10
SERVO DRIVER & POWER AMPLIFIERS	5-11

2. INDUCTANCE VALUES ARE IN MICROHENRIES (μH), UNLESS OTHERWISE NOTED.
3. CAPACITANCE VALUES ARE IN PICOFARADS (pF), UNLESS OTHERWISE NOTED.
4. RESISTANCE VALUES ARE IN OHMS. MULTIPLIERS: K = 1000, M = 1,000,000.
5. BAND SWITCH SECTIONS S101—S106 ARE SHOWN IN BAND I (190—400-KC) POSITION, UNLESS OTHERWISE NOTED. SWITCH SECTIONS SHOWN ARE AS VIEWED FROM THE FRONT OF THE RECEIVER WITH ROTORS AND TERMINALS IN THE SAME RELATIVE POSITION (BAND I). S101—S106 ARE ON A COMMON SHAFT. ANGULAR THROWS ARE 30° BETWEEN ALL BANDS. STATOR SECTORS ARE REPRESENTED BY THE LETTERS A, B, C, D, FOR THE FRONT SECTORS, AND D FOR THE REAR SECTOR. STATOR SECTORS IN USE ARE AS FOLLOWS: S101 - A, B, C, D; S102 - A, B, D; S103 - A, B; S104 - A, B, D; S105 - A, B, C, D; S106 - A, B, C, D.
6. THE INTERMEDIATE FREQUENCY (I-F) IS 142.5 KC (OSCILLATOR FREQUENCY IS HIGHER THAN SIGNAL FREQUENCY).
7. S107 SHOWN IN COMP POSITION.
8. C181 (3 OR 5 pF) INSTALLED IN SOME UNITS DURING FINAL FACTORY ADJUSTMENT.
9. VALUE OF R124 MAY BE CHANGED TO 39K WHEN REQUIRED TO SATISFY SENSITIVITY CONTROL REQUIREMENT.

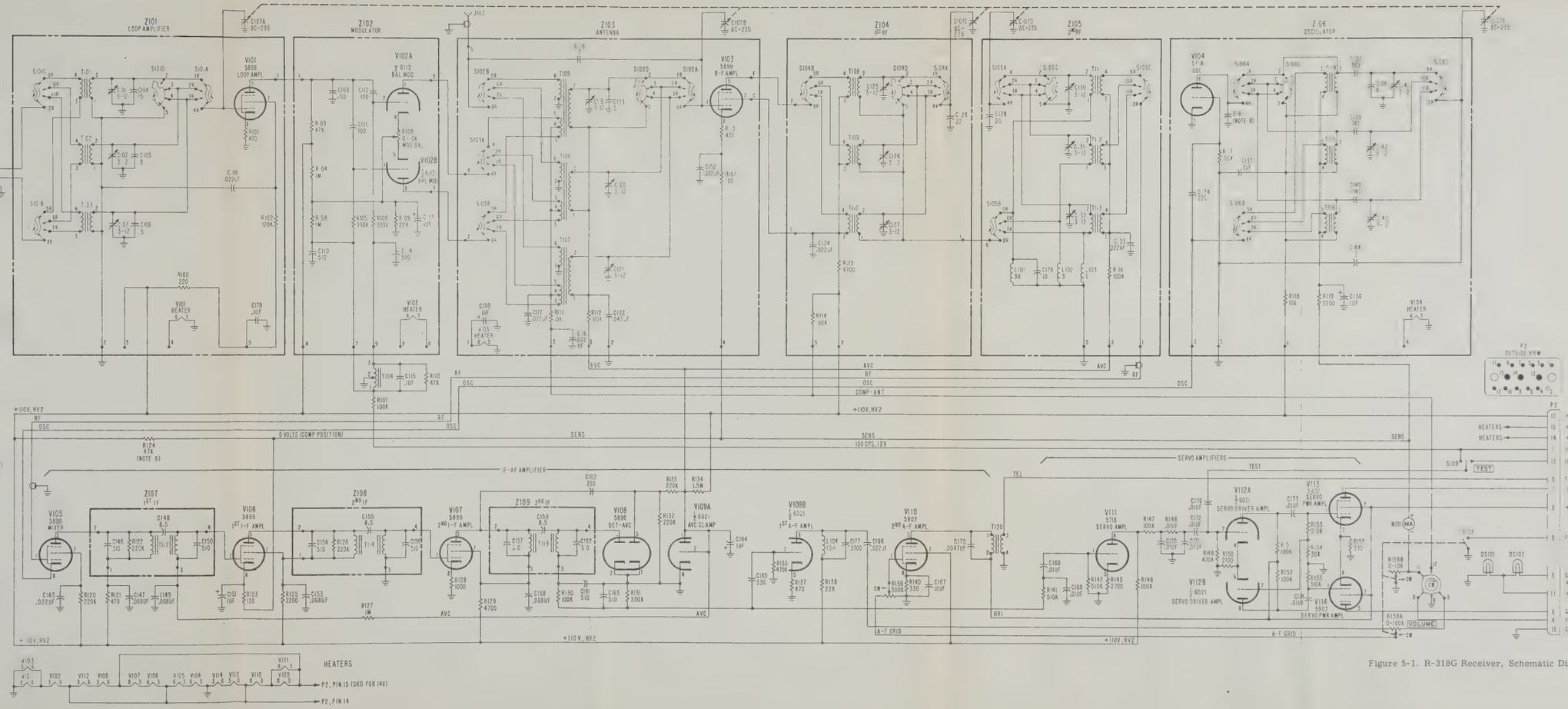
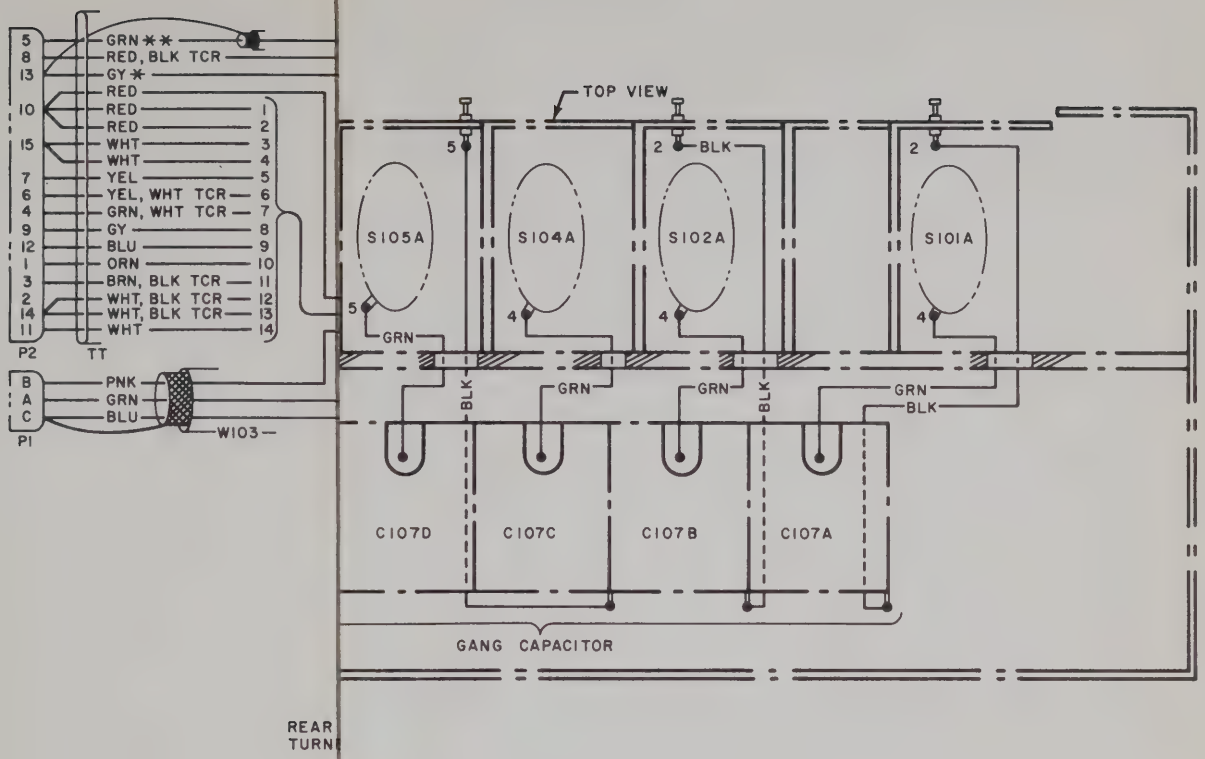
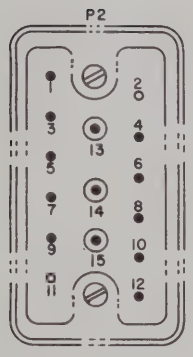
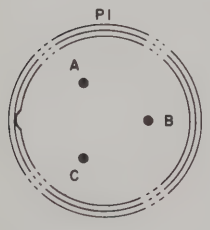


Figure 5-1. R-318G Receiver, Schematic Diagram







ATIC DIAGRAM, SEE FIGURE 5-1.

D WIRING DIAGRAMS ARE AS FOLLOWS:

SUBASSEMBLY	FIGURE NO.
LOOP AMPLIFIER	5-3
MODULATOR	5-4
ANTENNA ASSEMBLY	5-5
1ST R-F	5-6
2ND R-F	5-7
OSCILLATOR	5-8
I-F AND A-F AMPLIFIER	5-9
SERVO AMPLIFIER	5-10
SERVO DRIVER & POWER AMPLIFIERS	5-11

KED WITH COLOR NOTE ONLY ARE NO. 24 AWG STRANDED COPPER, TEF-TED.

ED WITH COLOR NOTE AND ASTERISK (*) IS NO. 16 AWG STRANDED COP-ITE INSULATED.

ED WITH COLOR NOTE AND DOUBLE ASTERISK (**) IS NO. 22 AWG SINGLE R COPPER, TEFLON INSULATED, WITH BRAIDED SHIELD.

WIRES ARE NO. 24 AWG BARE, SOLID, TINNED COPPER.

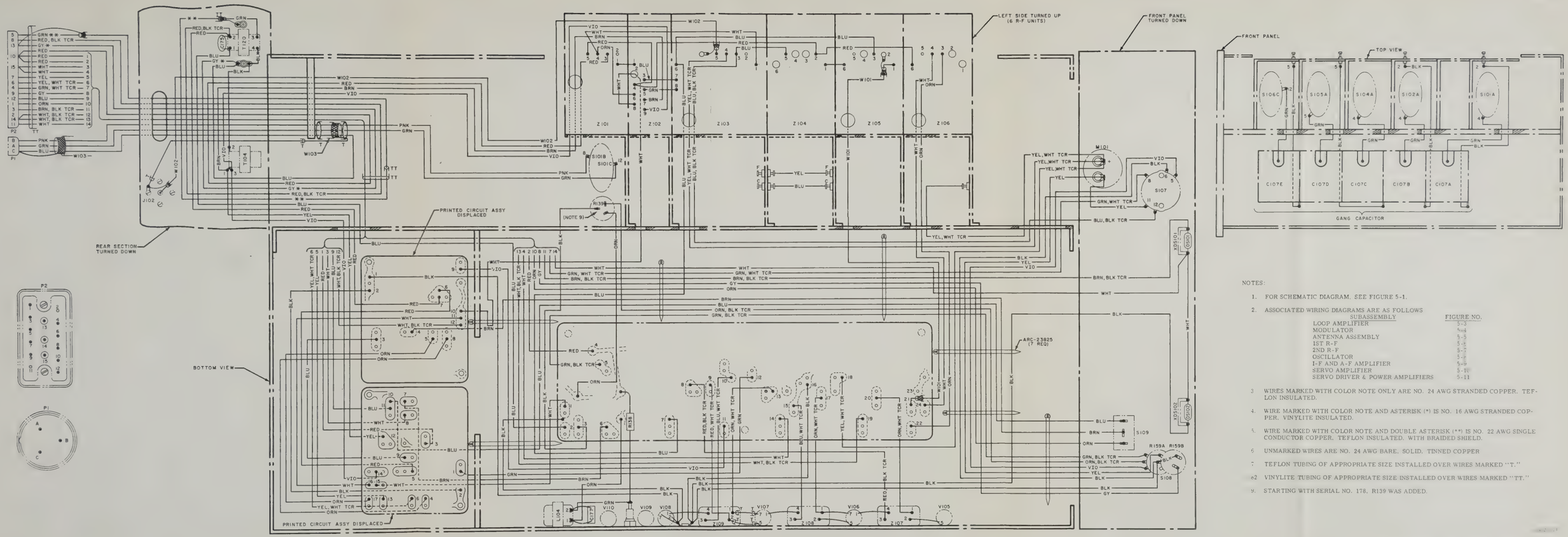
BING OF APPROPRIATE SIZE INSTALLED OVER WIRES MARKED "T."

UBING OF APPROPRIATE SIZE INSTALLED OVER WIRES MARKED "TT."

ITH SERIAL NO. 178, R139 WAS ADDED.

25402H(TP)

Figure 5-2. R-318G Receiver, Main Chassis, Wiring Diagram



NOTES:

1. FOR SCHEMATIC DIAGRAM, SEE FIGURE 5-1.
2. ASSOCIATED WIRING DIAGRAMS ARE AS FOLLOWS

SUBASSEMBLY	FIGURE NO.
LOOP AMPLIFIER	5-3
MODULATOR	5-4
ANTENNA ASSEMBLY	5-5
1ST R-F	5-6
2ND R-F	5-7
OSCILLATOR	5-8
I-F AND A-F AMPLIFIER	5-9
SERVO AMPLIFIER	5-10
SERVO DRIVER & POWER AMPLIFIERS	5-11

3. WIRES MARKED WITH COLOR NOTE ONLY ARE NO. 24 AWG STRANDED COPPER. TEFLON INSULATED.
4. WIRE MARKED WITH COLOR NOTE AND ASTERISK (*) IS NO. 16 AWG STRANDED COPPER. VINYLITE INSULATED.
5. WIRE MARKED WITH COLOR NOTE AND DOUBLE ASTERISK (**) IS NO. 22 AWG SINGLE CONDUCTOR COPPER, TEFLON INSULATED, WITH BRAIDED SHIELD.
6. UNMARKED WIRES ARE NO. 24 AWG BARE, SOLID, TINNED COPPER
7. TEFLON TUBING OF APPROPRIATE SIZE INSTALLED OVER WIRES MARKED "T."
8. VINYLITE TUBING OF APPROPRIATE SIZE INSTALLED OVER WIRES MARKED "TT."
9. STARTING WITH SERIAL NO. 178, R139 WAS ADDED.

Figure 5-2. R-318G Receiver, Main Chassis, Wiring Diagram

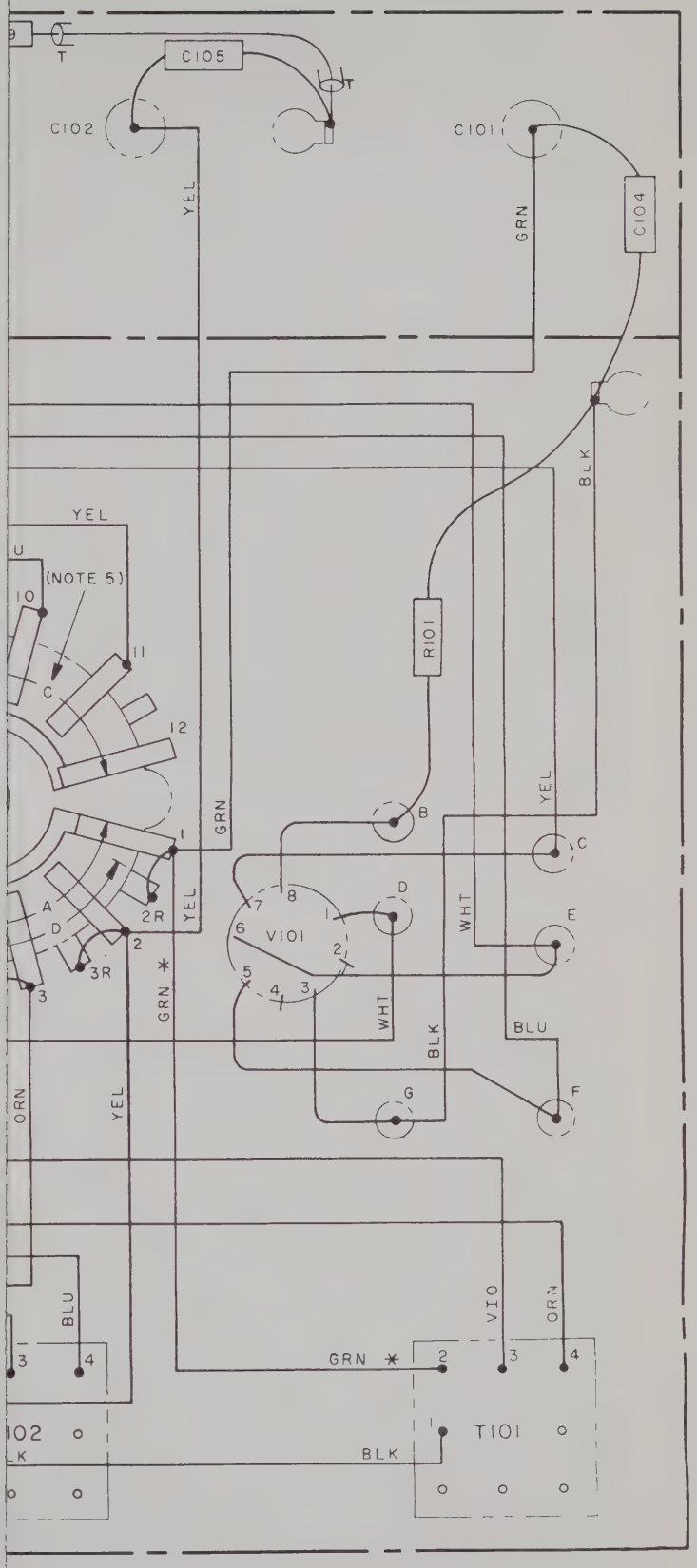


Figure 5-3. R-318G Receiver, Loop Amplifier Z101, Wiring Diagram

NOTES:

1. FOR SCHEMATIC DIAGRAM, SEE FIGURE 5-1.
2. FOR MAIN CHASSIS WIRING DIAGRAM, SEE FIGURE 5-2.
3. WIRES MARKED WITH COLOR NOTE ARE NO. 24 AWG SOLID COPPER, TEFLON INSULATED.
4. UNMARKED WIRES ARE NO. 24 AWG BARE, SOLID, TINNED COPPER.
5. SWITCH SECTIONS:

SECTION	TERMINALS
S101A	1, 2, 3, 4
S101B	5, 6, 7, 8
S101C	9, 10, 11, 12
S101D	2R, 3R, 4R, 5R

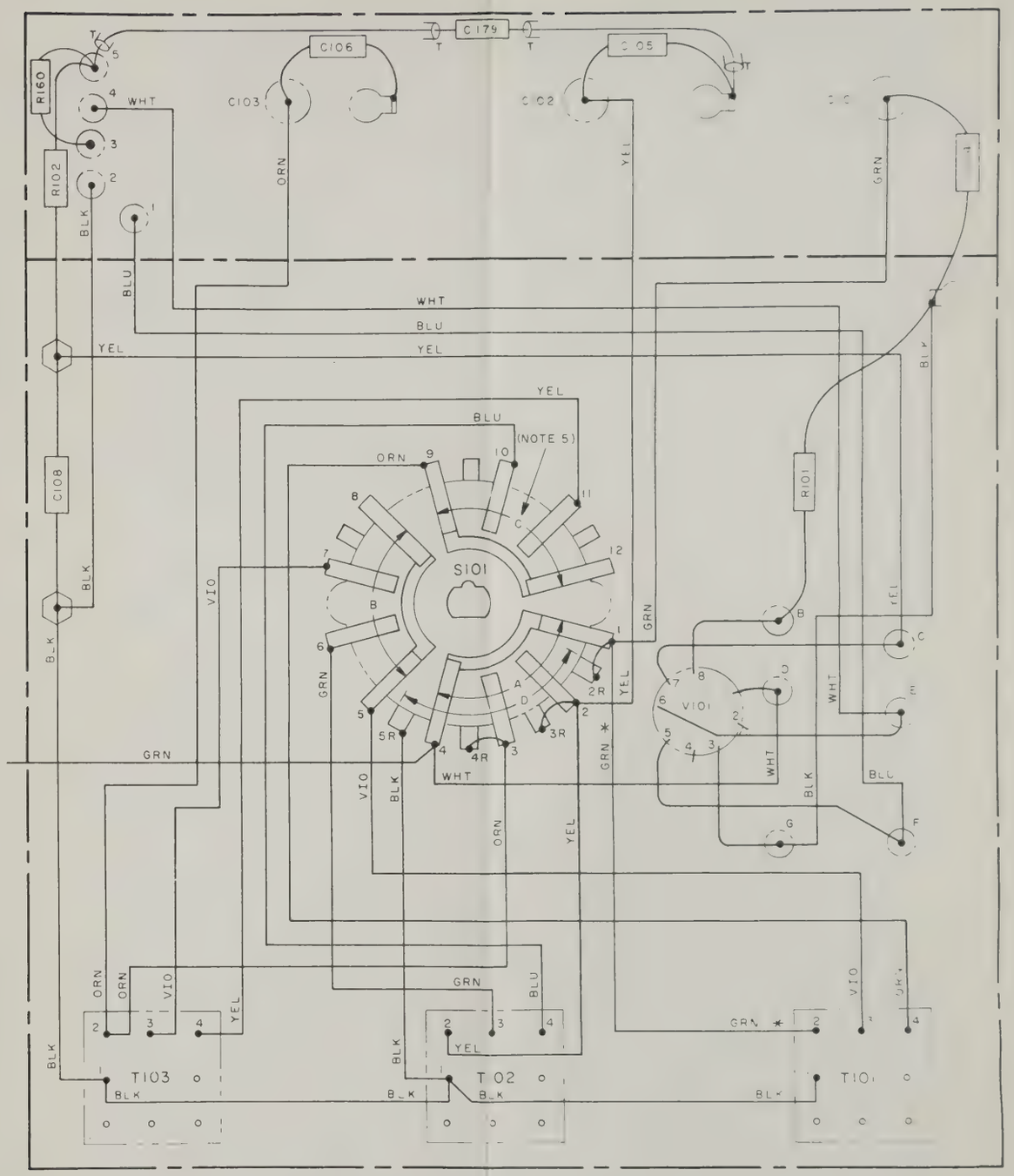


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Figure 5-3. R-318G Receiver, Loop Amplifier Z101, Wiring Diagram

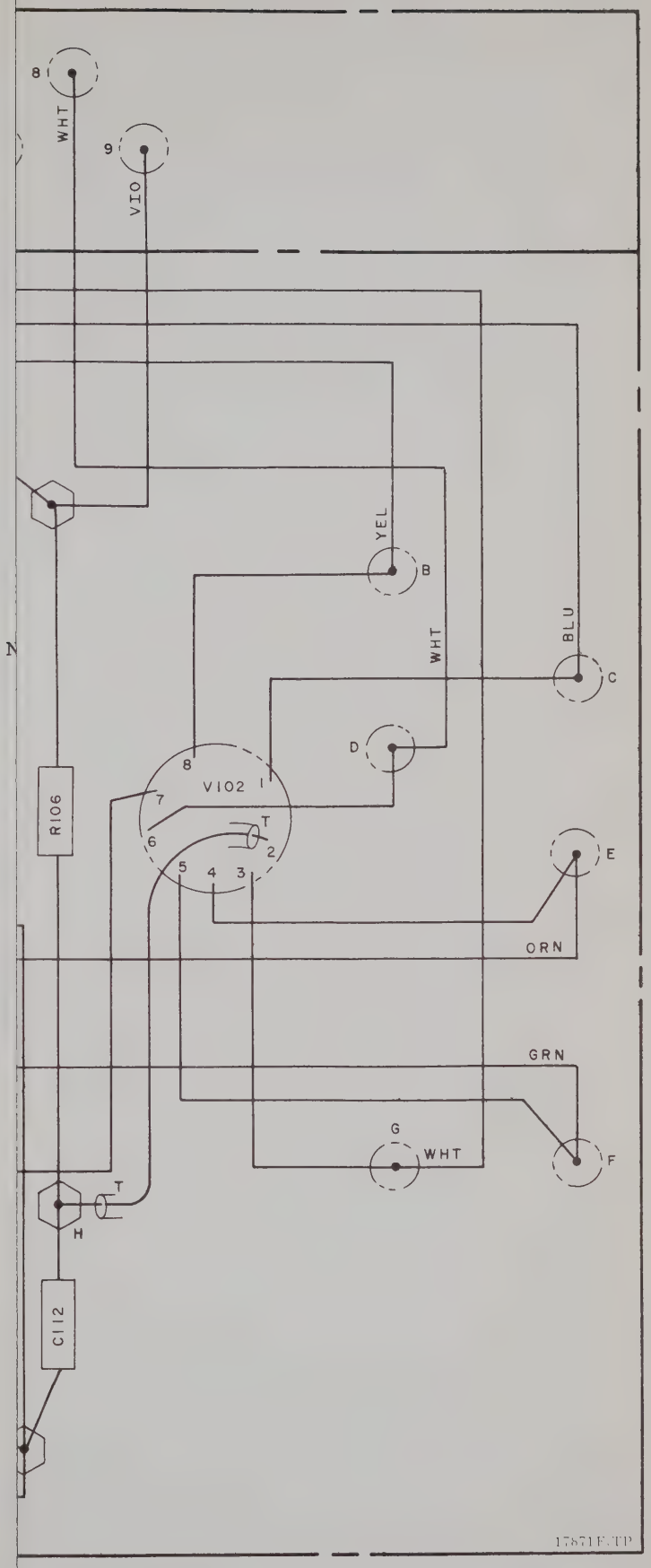


Figure 5-4. R-318G Receiver, Modulator Z102, Wiring Diagram

NOTES:

1. FOR SCHEMATIC DIAGRAM, SEE FIGURE 5-1.
2. FOR MAIN CHASSIS WIRING DIAGRAM, SEE FIGURE 5-2.
3. WIRES MARKED WITH COLOR NOTE ARE NO. 24 AWG SOLID COPPER, TEFLON INSULATED.
4. TEFLON IMPREGNATED FIBERGLAS TUBING (.032 INCH I. D.) IS INSTALLED OVER WIRE MARKED "T."

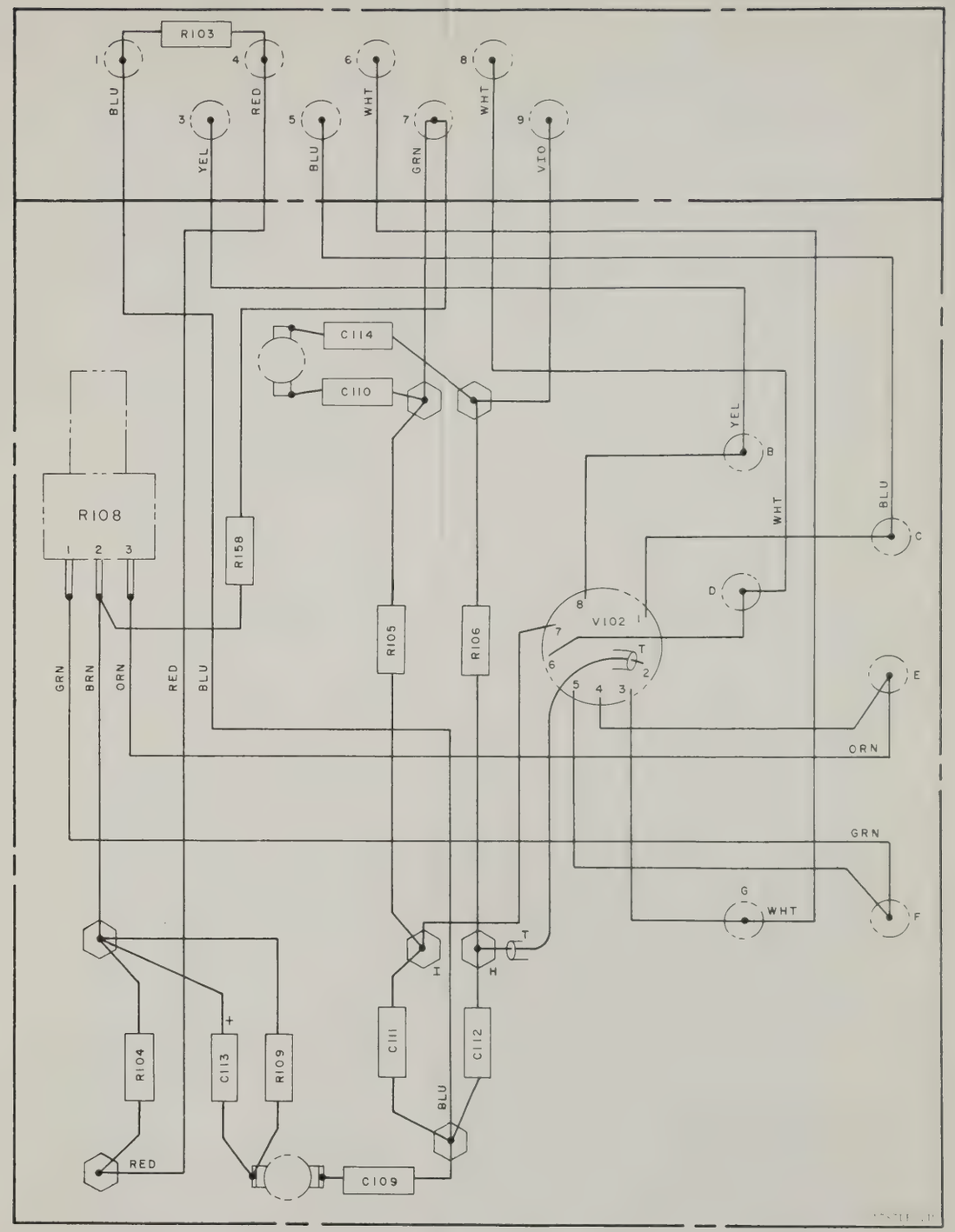


Figure 5-4. R-318G Receiver, Modulator Z102, Wiring Diagram

NOTES:

1. FOR SCHEMATIC DIAGRAM, SEE FIGURE 5-1
2. FOR MAIN CHASSIS WIRING DIAGRAM, SEE F URE 5-2.
3. WIRES MARKED WITH COLOR NOTE ARE NO. AWG SOLID COPPER, TEFLON INSULATED.
4. UNMARKED WIRES ARE NO. 24 AWG BARE, SOLID, TINNED COPPER.
5. PLASTIC COATED FIBERGLAS TUBING (0.032 INCH I.D.) IS INSTALLED OVER WIRES MARK "T."
6. SWITCH SECTIONS (TERMINAL GROUPS FOR SWITCH SECTIONS IN S102 AND S103) ARE IDENTICAL.

SECTION	TERMINALS
A	1, 2, 3, 4
B	5, 6, 7, 8
C	9, 10, 11, 12
D	2R, 3R, 4R, 5R, 8R, 10R, 12I

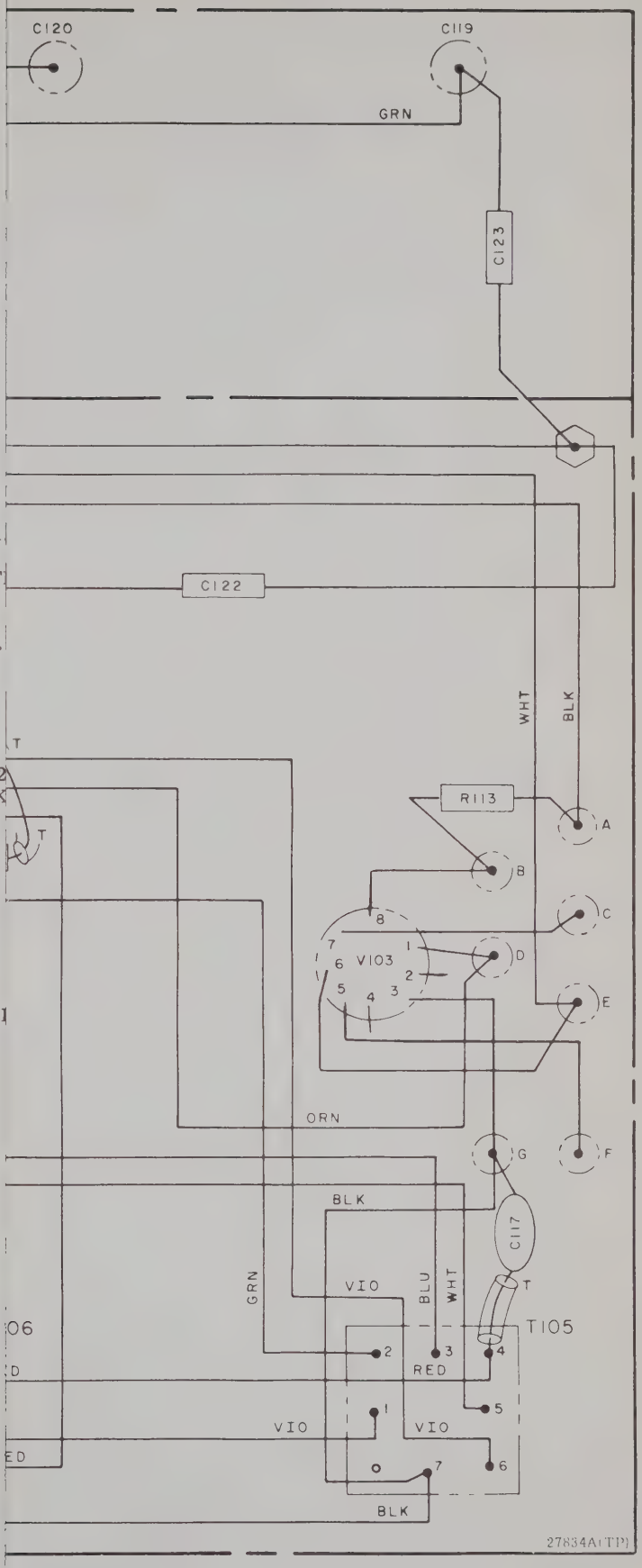
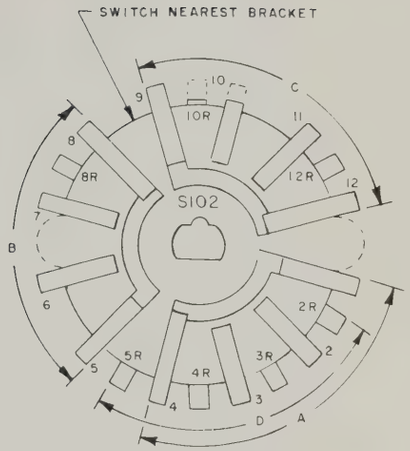


Figure 5-5. R-318G Receiver, Antenna Assembly Z103, Wiring Diagram

NOTES:

1. FOR SCHEMATIC DIAGRAM, SEE FIGURE 5-1.
2. FOR MAIN CHASSIS WIRING DIAGRAM, SEE FIGURE 5-2.
3. WIRES MARKED WITH COLOR NOTE ARE NO. 24 AWG SOLID COPPER, TEFLON INSULATED.
4. UNMARKED WIRES ARE NO. 24 AWG BARE, SOLID, TINNED COPPER.
5. PLASTIC COATED FIBERGLAS TUBING (0.032 INCH I.D.) IS INSTALLED OVER WIRES MARKED "T."
6. SWITCH SECTIONS (TERMINAL GROUPS FOR SWITCH SECTIONS IN S102 AND S103) ARE IDENTICAL.

SECTION	TERMINALS
A	1, 2, 3, 4
B	5, 6, 7, 8
C	9, 10, 11, 12
D	2R, 3R, 4R, 5R, 8R, 10R, 12R



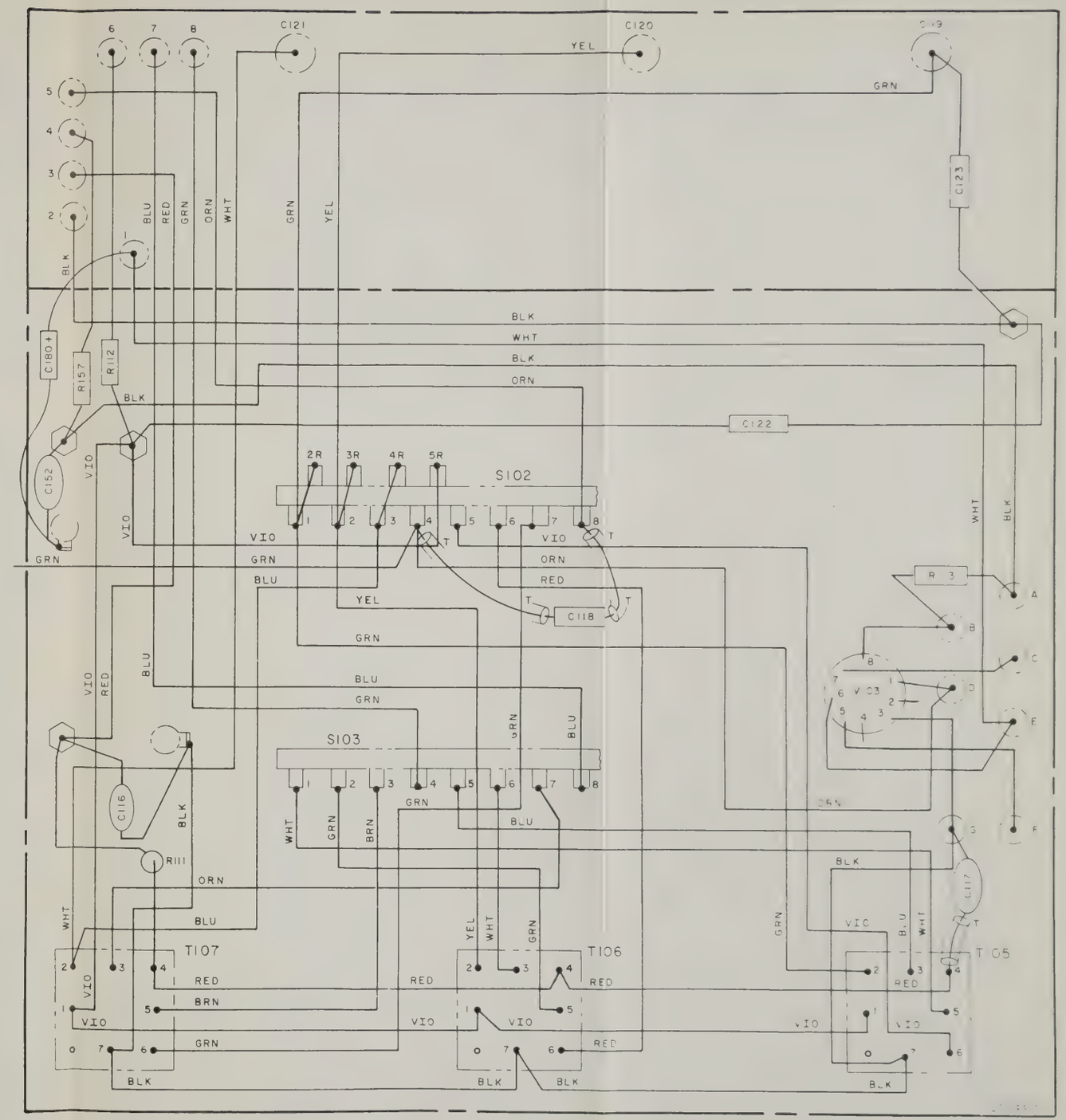


Figure 5-5. R-318G Receiver, Antenna Assembly Z103, Wiring Diagram

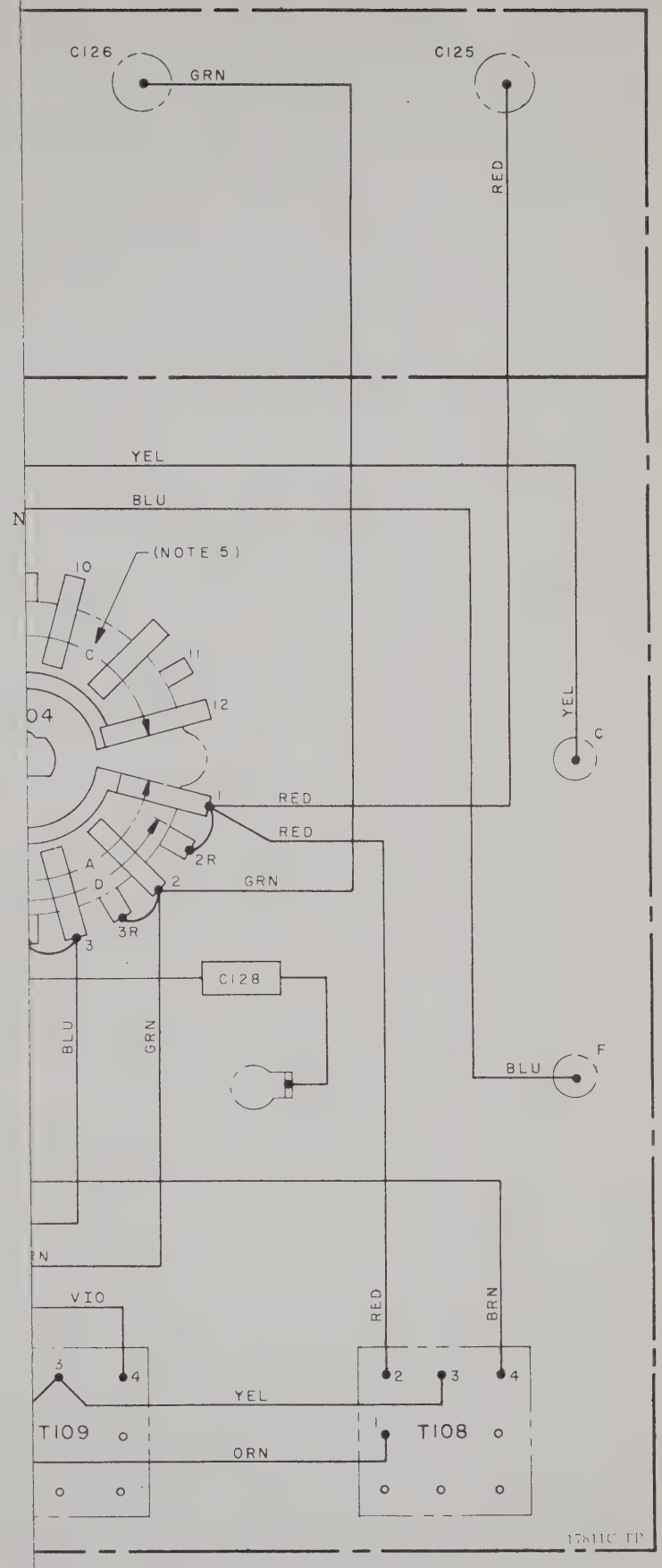


Figure 5-6. R-318G Receiver, First R-f Z104, Wiring Diagram

NOTES:

1. FOR SCHEMATIC DIAGRAM, SEE FIGURE 5-1.
2. FOR MAIN CHASSIS WIRING DIAGRAM, SEE FIGURE 5-2.
3. WIRES MARKED WITH COLOR NOTE ARE NO. 24 AWG SOLID COPPER, TEFLON INSULATED.
4. UNMARKED WIRES ARE NO. 24 AWG BARE, SOLID, TINNED COPPER.
5. SWITCH SECTIONS:

SECTION	TERMINALS
S104A	1, 2, 3, 4
S104B	5, 6, 7, 8
S104C	9, 10, 11, 12
S104D	2R, 3R, 4R, 5R

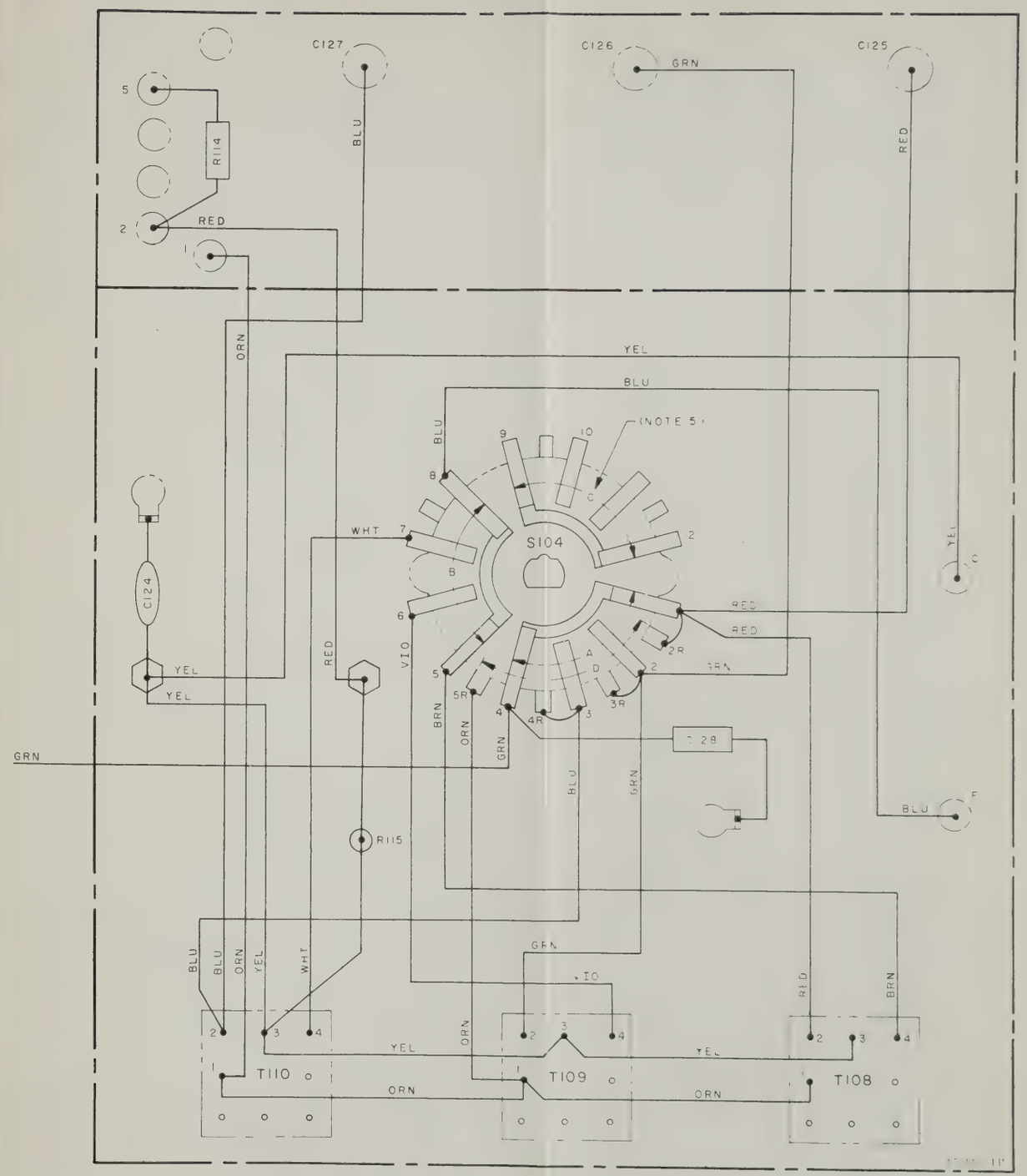


Figure 5-6. R-318G Receiver, First R-f Z104, Wiring Diagram

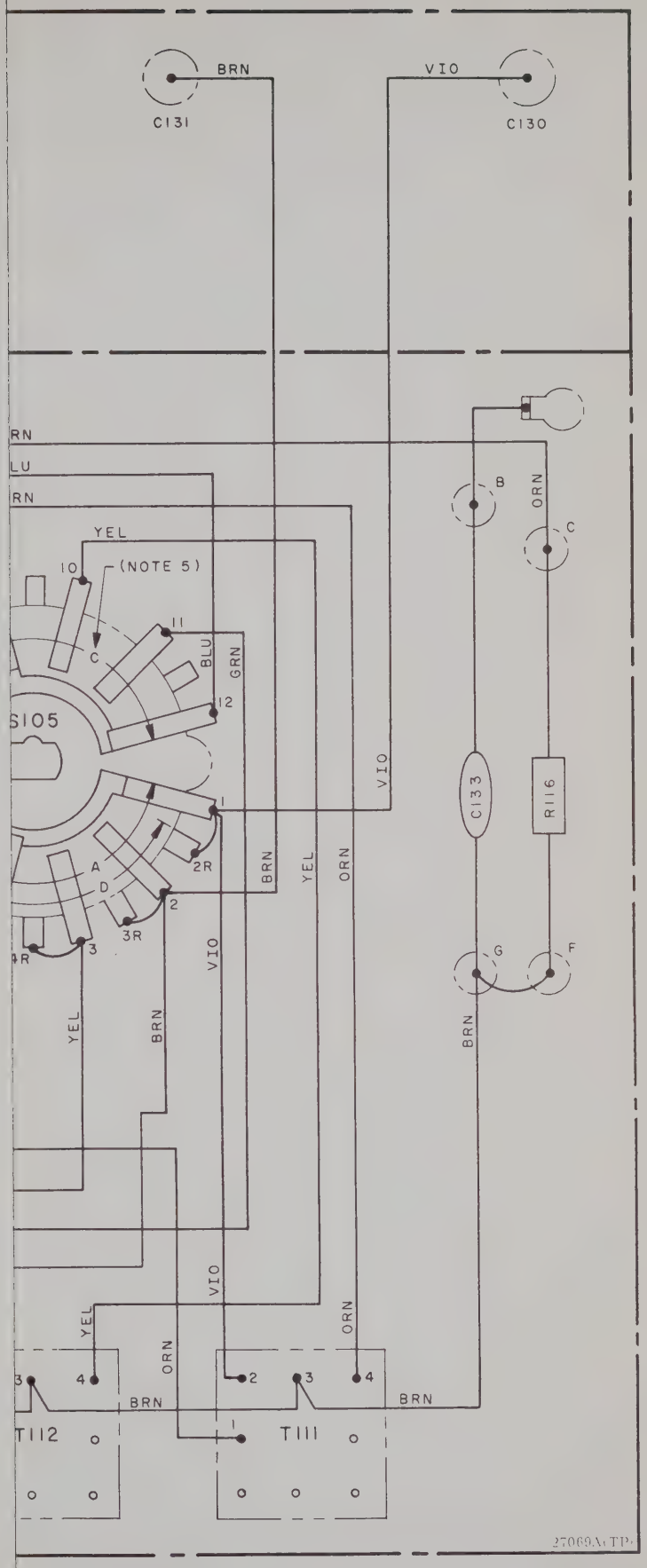


Figure 5-7. R-318G Receiver, Second R-f Z105, Wiring Diagram

NOTES:

1. FOR SCHEMATIC DIAGRAM, SEE FIGURE 5-1.
2. FOR MAIN CHASSIS WIRING DIAGRAM, SEE FIGURE 5-2.
3. WIRES MARKED WITH COLOR NOTE ARE NO. 24 AWG SOLID COPPER, TEFLON INSULATED.
4. UNMARKED WIRES ARE NO. 24 AWG BARE, SOLID, TINNED COPPER.
5. SWITCH SECTIONS:

SECTION	TERMINALS
S105A	1, 2, 3, 4
S105B	5, 6, 7, 8
S105C	9, 10, 11, 12
S105D	2R, 3R, 4R, 5R

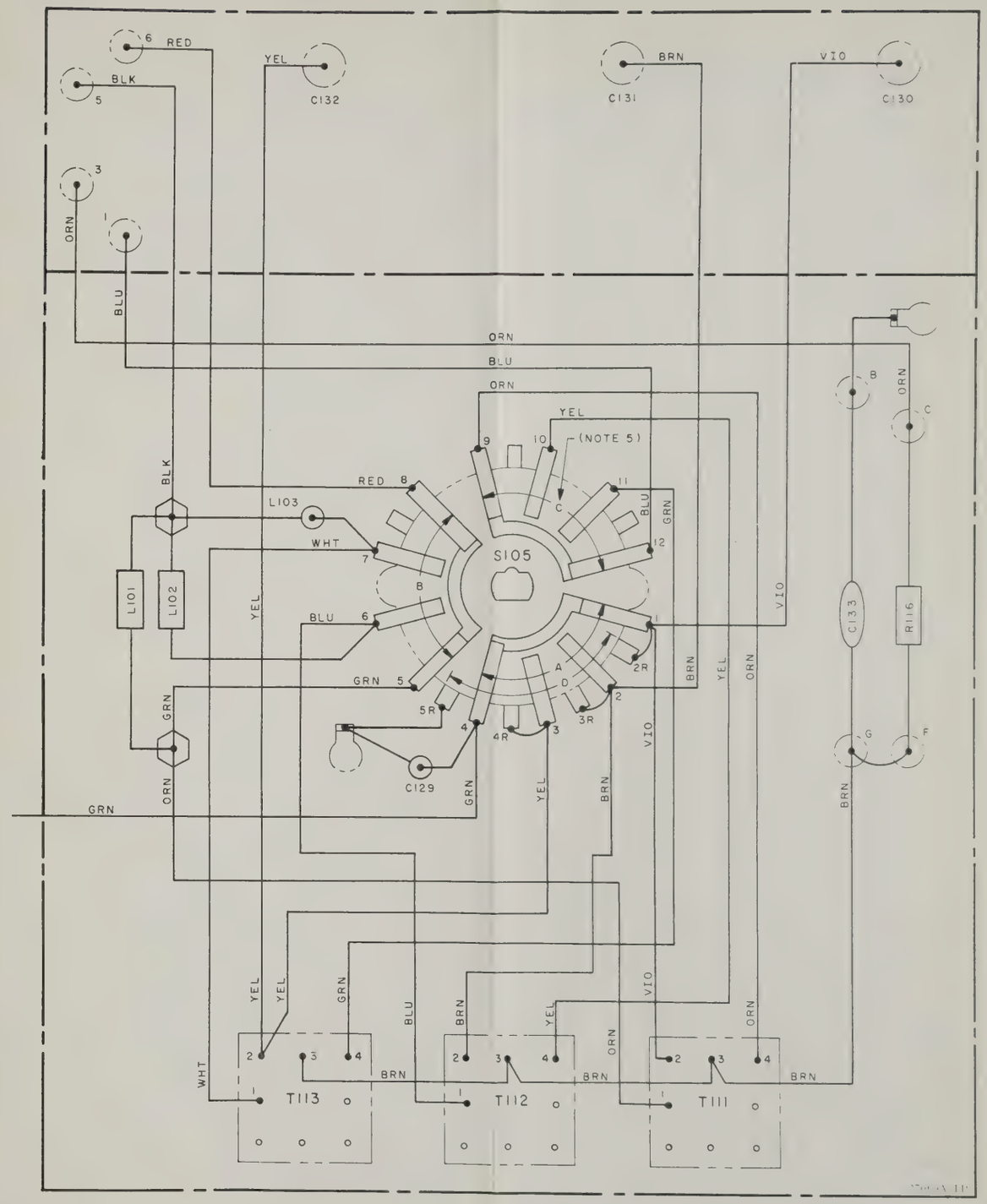
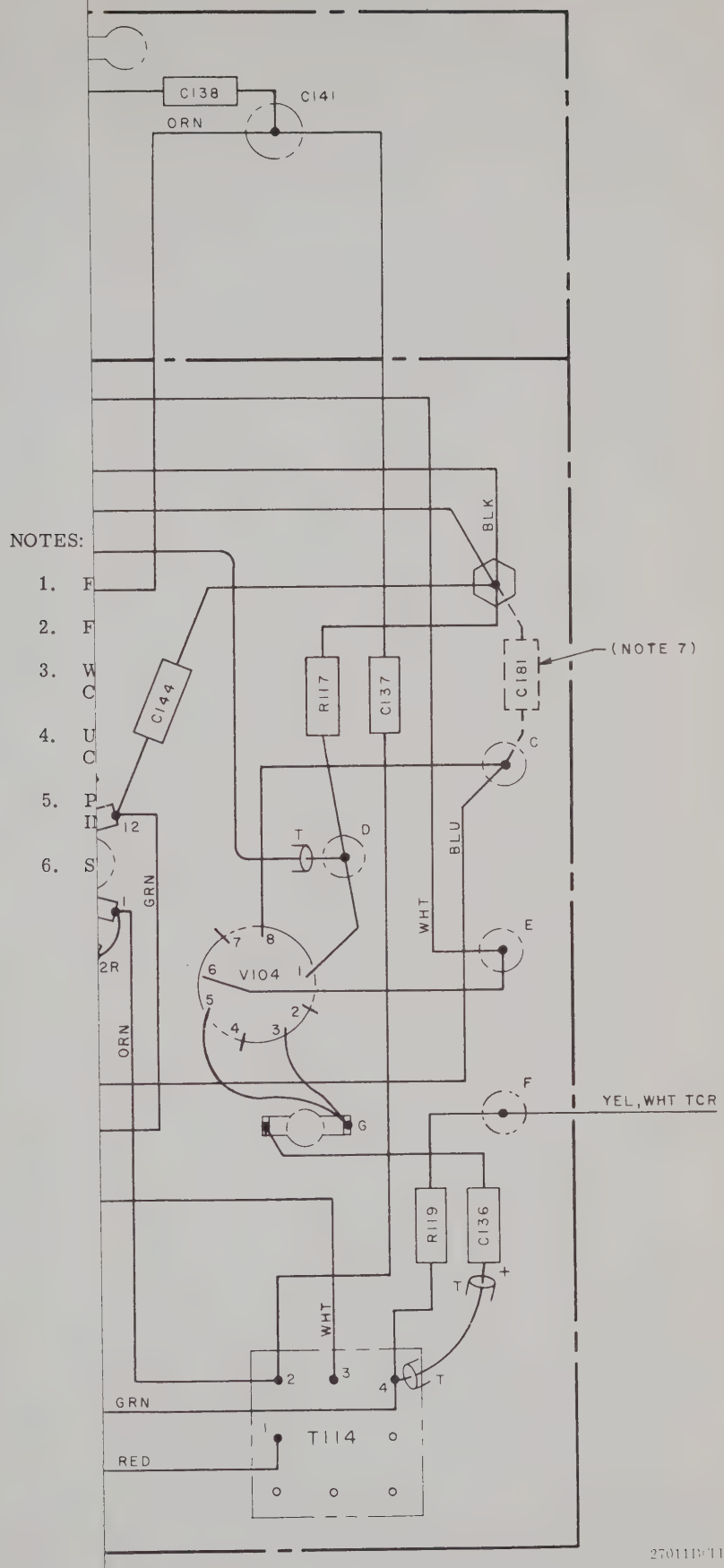


Figure 5-7. R-318G Receiver, Second R-f Z105, Wiring Diagram



NOTES:

1. F
2. F
3. W C
4. U C
5. P I
6. S

Figure 5-8. R-318G Receiver, Oscillator Z106, Wiring Diagram

NOTES:

1. FOR SCHEMATIC DIAGRAM, SEE FIGURE 5-1.
2. FOR MAIN CHASSIS WIRING DIAGRAM, SEE FIGURE 5-2.
3. WIRES MARKED WITH COLOR NOTE ARE NO. 24 AWG SOLID COPPER, TEFLON INSULATED.
4. UNMARKED WIRES ARE NO. 24 AWG BARE, SOLID, TINNED COPPER.
5. PLASTIC COATED FIBERGLAS TUBING (0.032 INCH I.D.) IS INSTALLED OVER WIRES MARKED "T."
6. SWITCH SECTIONS:

SECTION	TERMINALS
S106A	1, 2, 3, 4
S106B	5, 6, 7, 8
S106C	9, 10, 11, 12
S106D	2R, 3R, 4R, 5R

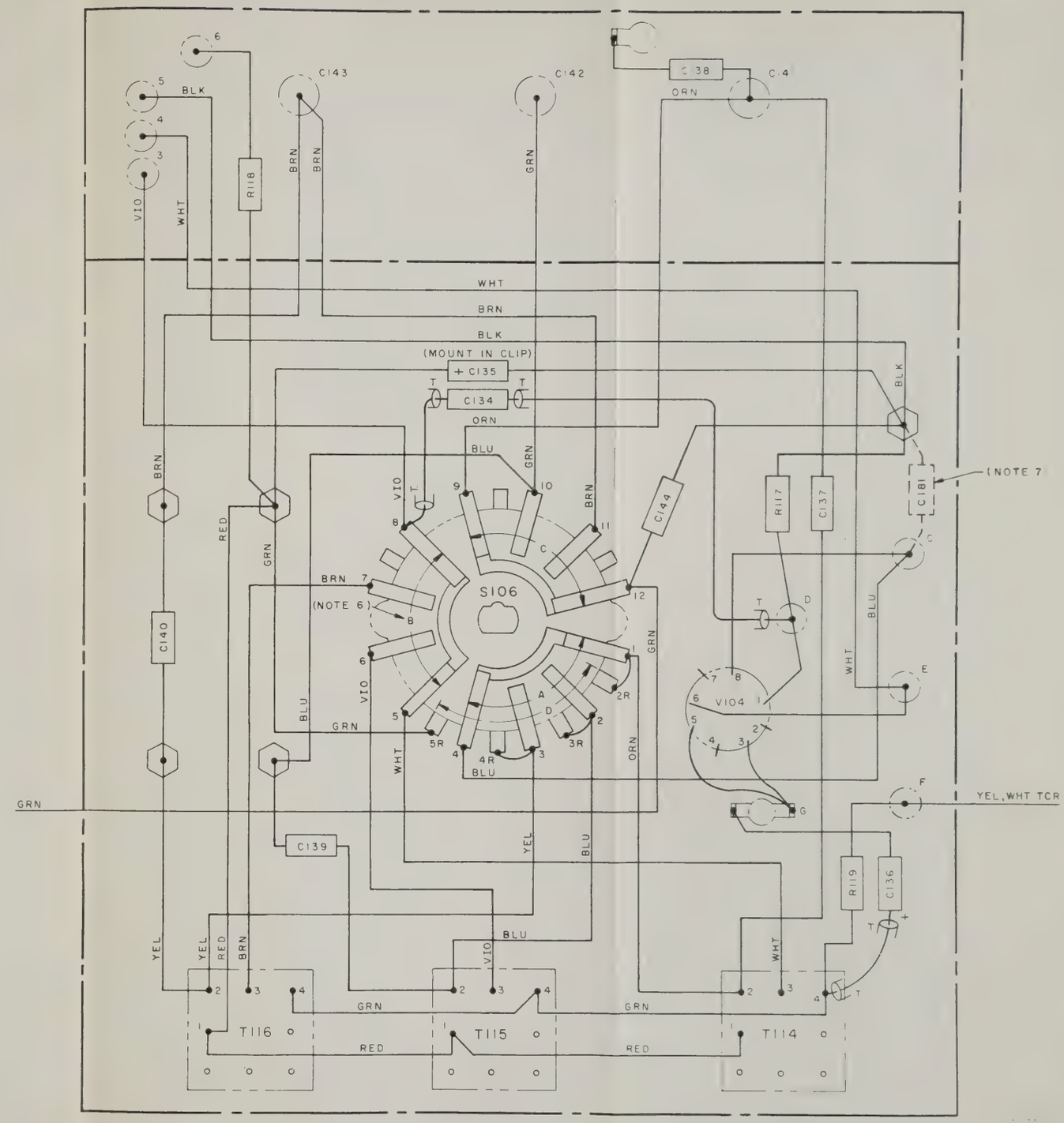
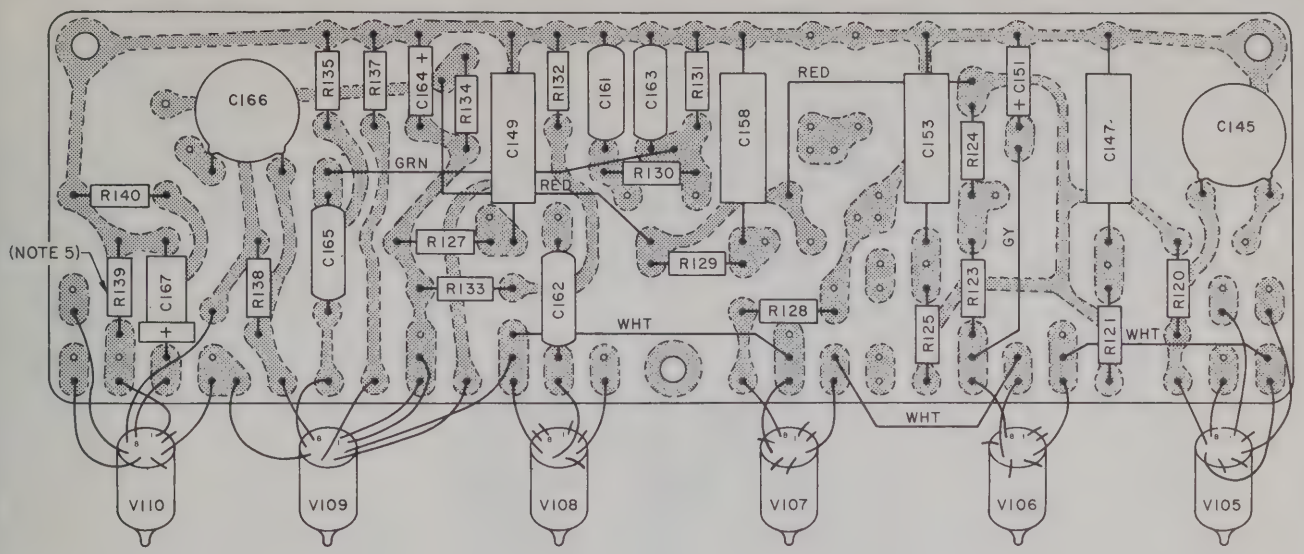


Figure 5-8. R-318G Receiver, Oscillator Z106, Wiring Diagram



NOTES:

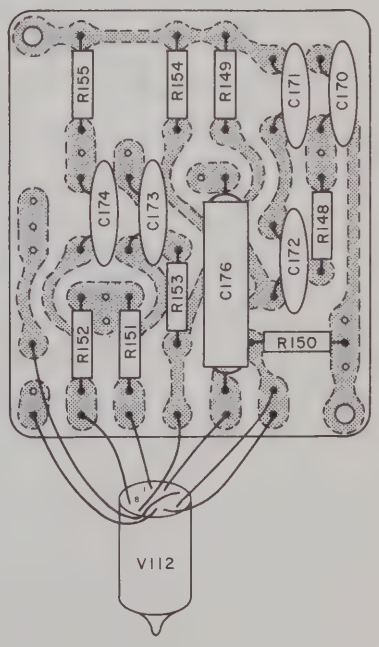
1. FOR SCHEMATIC DIAGRAM, SEE FIGURE 5-1.
2. FOR MAIN CHASSIS WIRING DIAGRAM, SEE FIGURE 5-2.
3. WIRES MARKED WITH COLOR NOTE ARE NO. 24 AWG STRANDED COPPER, TEFLON INSULATED.
4. SHADED AREA DENOTES UNETCHED COPPER ON OPPOSITE SIDE OF BOARD.

26067D(TP)

Figure 5-9. R-318G Receiver, I-f and A-f Amplifier, Wiring Diagram

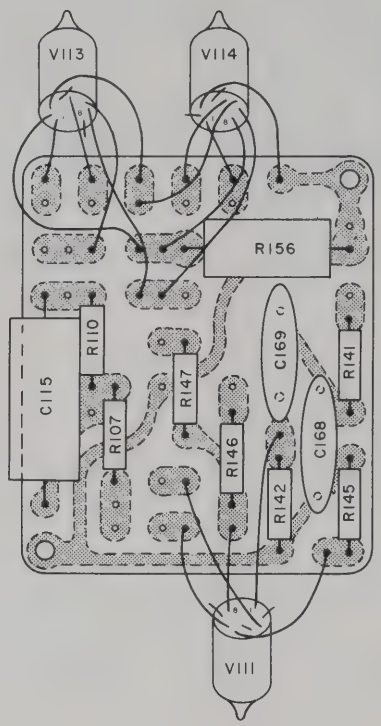
NOTES:

1. FOR SCHEMATIC DIAGRAM, SEE FIGURE 5-1.
2. FOR MAIN CHASSIS WIRING DIAGRAM, SEE FIGURE 5-2.
3. SHADED AREA DENOTES UNETCHED COPPER ON OPPOSITE SIDE OF BOARD.



26065A(TP)

Figure 5-10. R-318G Receiver, Servo Amplifier V112, Wiring Diagram

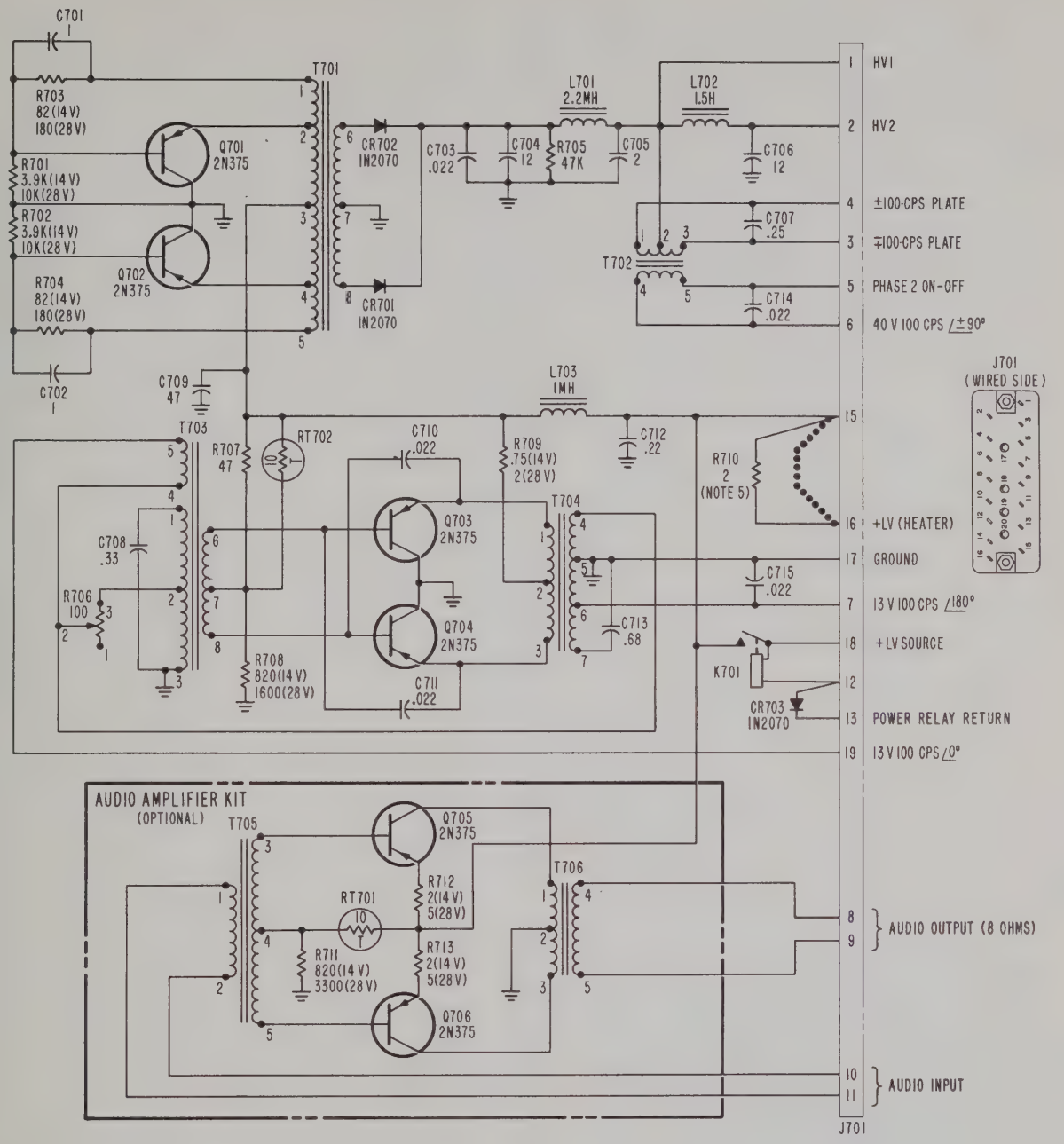


NOTES:

1. FOR SCHEMATIC DIAGRAM, SEE FIGURE 5-1.
2. FOR MAIN CHASSIS WIRING DIAGRAM, SEE FIGURE 5-2.
3. SHADED AREA DENOTES UNETCHED COPPER ON OPPOSITE SIDE OF BOARD.

26063(TP)

Figure 5-11. R-318G Receiver, Servo Driver and Power Amplifiers V111, V113, and V114, Wiring Diagram

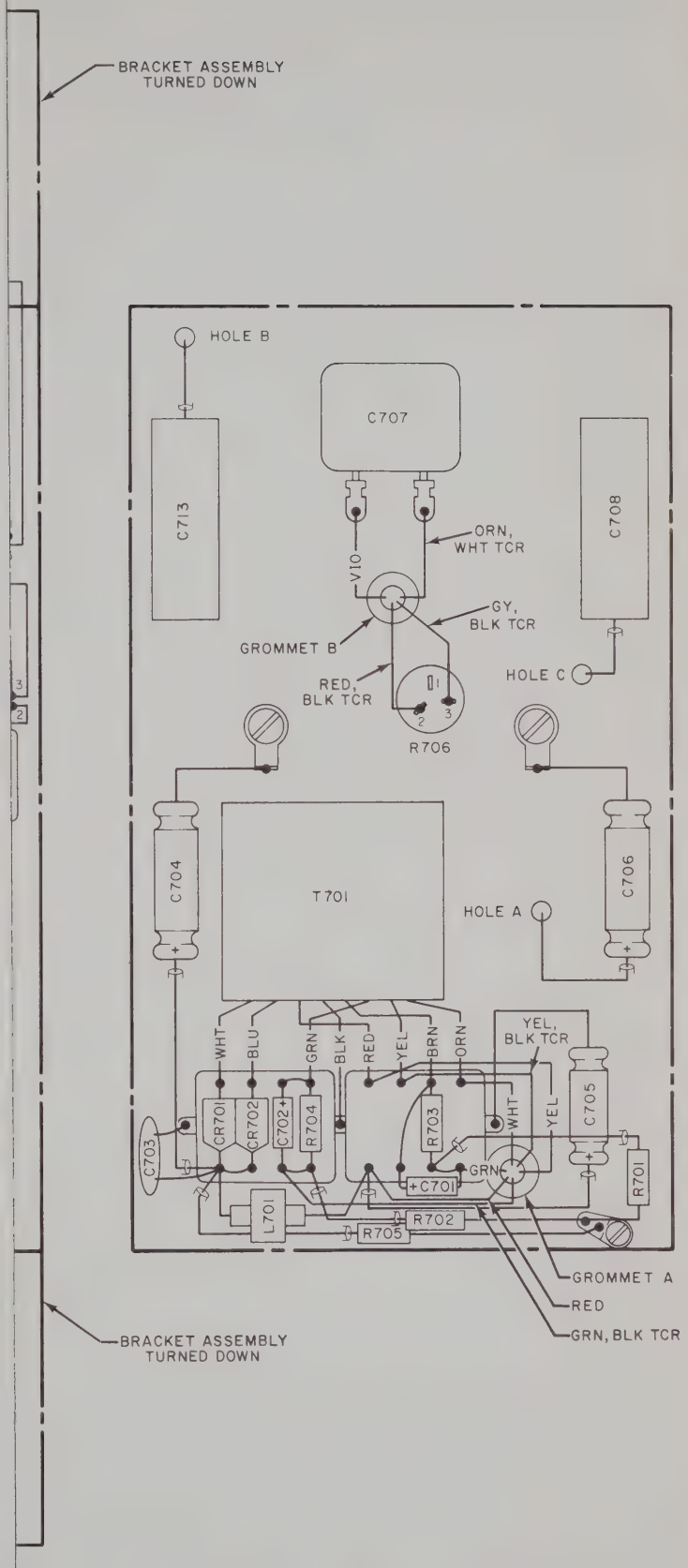


NOTES:

1. FOR WIRING DIAGRAM, SEE FIGURE 5-13.
2. RESISTOR VALUES ARE IN OHMS. MULTIPLIER K = 1000.
3. CAPACITOR VALUES ARE IN MICROFARADS (μF).
4. INDUCTOR VALUES ARE IN HENRIES UNLESS OTHERWISE NOTED.
5. IN 14-VOLT MODEL, R710 IS REPLACED BY WIRE MARKED ●●●●.

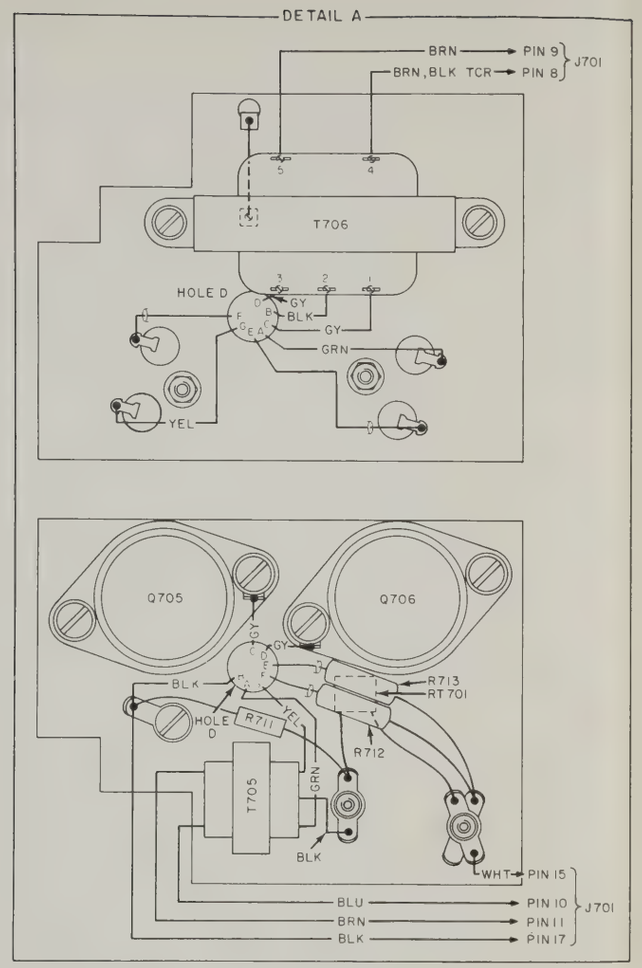
26961A(TP)

Figure 5-12. DV-318A Dynaverter, Schematic Diagram



269621 276241B(TP)

Figure 5-13. DV-318A Dynaverter, Wiring Diagram



NOTES:

1. FOR SCHEMATIC DIAGRAM, SEE FIGURE 5-12.
2. UNMARKED WIRES ARE NO. 22 AWG BARE, SOLID, TINNED COPPER. WIRES MARKED WITH COLOR NOTE ARE NO. 24 AWG STRANDED COPPER, TEFLON INSULATED. WIRES MARKED WITH COLOR NOTE AND ASTERISK (*) ARE NO. 22 AWG STRANDED COPPER, TEFLON INSULATED.
3. TEFLON TUBING (0.040 IN. I. D.) INSTALLED OVER WIRES DESIGNATED ⊖—.
4. IN 14-VOLT MODEL, R710 IS REPLACED BY WIRE MARKED ••••.

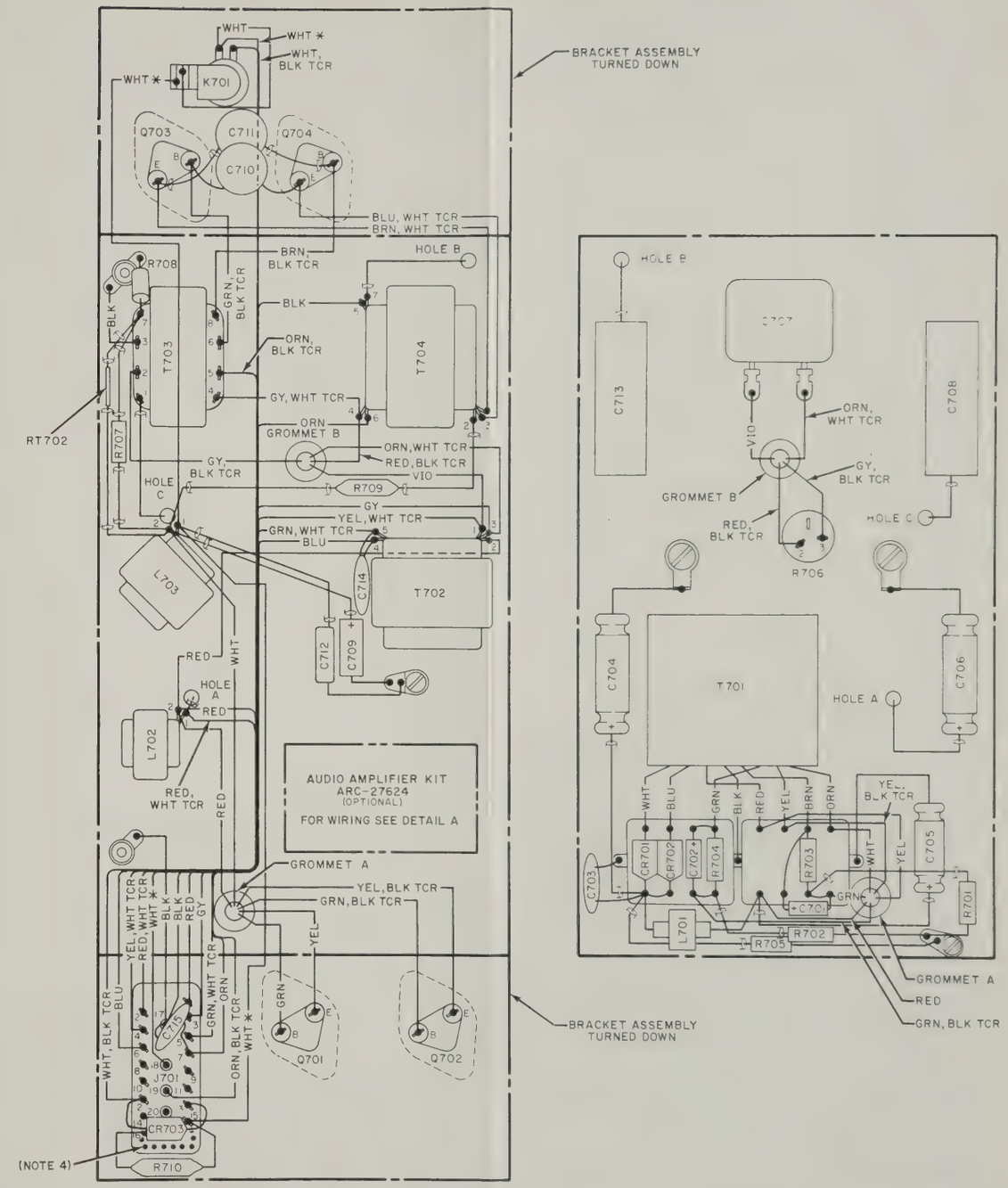
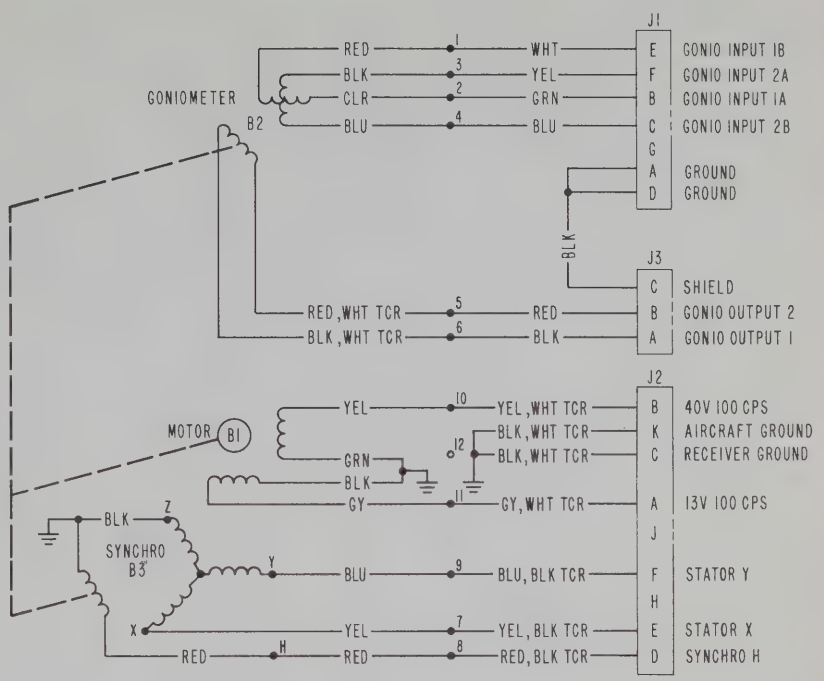


Figure 5-13. DV-318A Dynaverter, Wiring Diagram

NOTE:

IN-21B IS INTERNALLY WIRED FOR A BOTTOM-MOUNTED LOOP ANTENNA AND TOP-MOUNTED SENSE ANTENNA. IF OTHER LOCATIONS ARE USED, REWIRE TERMINALS AS FOLLOWS:

	TERMINAL NUMBER			
	TOP LOOP		BOTTOM LOOP	
WIRE COLOR	TOP SENSE	BOTTOM SENSE	TOP SENSE	BOTTOM SENSE
RED	6	5	5	6
BLACK	5	6	6	5
GREEN	1	1	2	2
WHITE	2	2	1	1



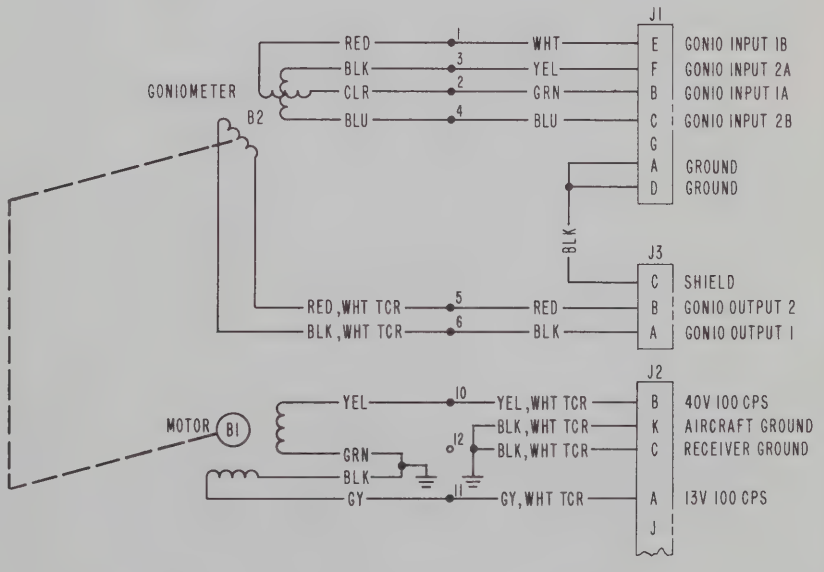
P/032670D(TP)

Figure 5-14. IN-21B Goniometer-Indicator, Schematic Diagram

NOTE:

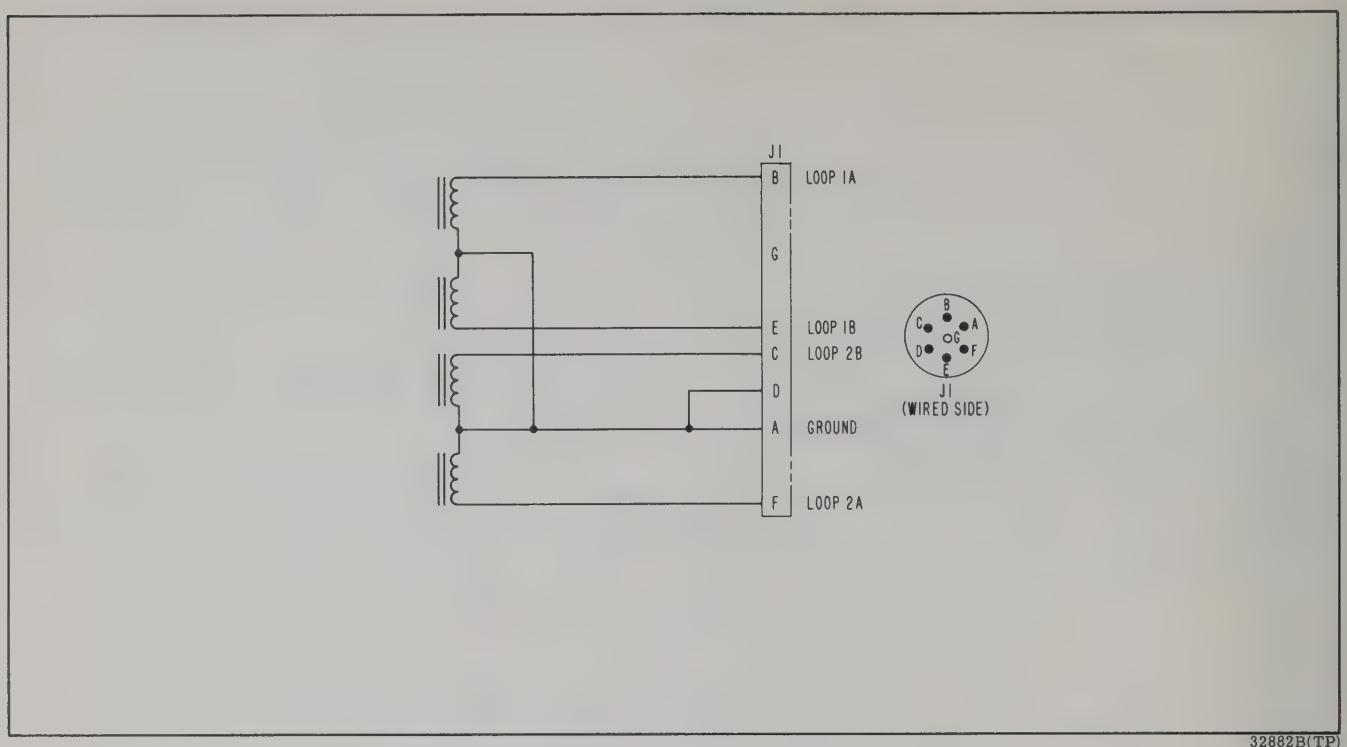
IN-21C IS INTERNALLY WIRED FOR A BOTTOM-MOUNTED LOOP ANTENNA AND TOP-MOUNTED SENSE ANTENNA. IF OTHER LOCATIONS ARE USED, REWIRE TERMINALS AS FOLLOWS:

	TERMINAL NUMBER			
	TOP LOOP		BOTTOM LOOP	
WIRE COLOR	TOP SENSE	BOTTOM SENSE	TOP SENSE	BOTTOM SENSE
RED	6	5	5	6
BLACK	5	6	6	5
GREEN	1	1	2	2
WHITE	2	2	1	1



P/033550D(TP)

Figure 5-15. IN-21C Goniometer-Indicator, Schematic Diagram

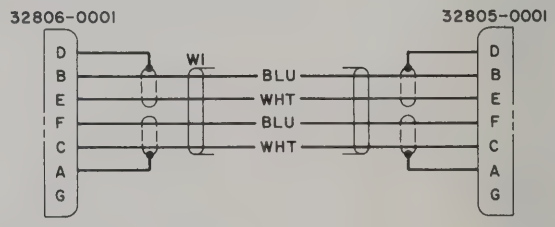


32882B(TP)

Figure 5-16. L-318G Loop Antenna, Schematic Diagram

NOTES:

1. EACH WIRE OF CABLE MARKED W1 IS NO. 30 AWG STRANDED COPPER, TEFLON INSULATED. A BLUE WIRE AND A WHITE WIRE ARE PAIRED IN A COMMON SHIELD HAVING A VINYLITE JACKET.
2. VINYLITE TUBING OF APPROPRIATE SIZE INSTALLED OVER WIRES MARKED —⊖—.



32803B(TP)

Figure 5-17. Loop Cable Assembly 32803, Wiring Diagram

NOTE: EACH WIRE IS NO. 38 AWG STRANDED COPPER, TEFLON INSULATED IN A COMMON SHIELD HAVING A VINYLITE JACKET.

33488C(TP)

Figure 5-18. Receiver Cable Assembly 33488-0001, Wiring Diagram

PARTS CATALOG

318G AUTOMATIC DIRECTION FINDER

AIRCRAFT RADIO CORPORATION
Boonton, New Jersey

318G

AUTOMATIC DIRECTION FINDER

PARTS CATALOG

TABLE OF CONTENTS

INTRODUCTION

This parts catalog contains parts information for the 318G Automatic Direction Finder, manufactured by Aircraft Radio Corporation, Boonton, New Jersey.

The part numbers of the mountings and accessories are listed in Table 1-1 of the instruction book.

The listings for the R-318G and DV-318A are arranged in an alphabetical-numerical sequence of the reference designations shown in Figures 5-1 and 5-12. The listing for the IN-21B and IN-21C is arranged in a suggested order of disassembly, as shown in the exploded view.

In addition to identifying and describing the parts, ARC part numbers and manufacturers' codes and part numbers for those parts not manufactured by Aircraft Radio Corporation are included in these parts lists. This information is inserted either in the description column, following the description of the part, or in a separate column. The names and addresses of the manufacturers and the codes used in the parts lists are as follows:

Code	Name and Address
AB	Allen-Bradley Co. Milwaukee, Wisconsin
AMP	Amphenol-Borg Electronics Corp. Broadview (Chicago), Illinois
BERK	Berkshire Transformer Corp. Kent, Connecticut
CIN	Cinch Manufacturing Corp. Chicago, Illinois
CLD	Cornell-Dubilier Electric Corp. South Plainfield, New Jersey
CLIP	Clifton Precision Products Co. Clifton Heights, Pennsylvania
CMPB	Colin Campbell Co., Inc. Danbury, Connecticut
CN	Centralab Division Globe-Union, Inc. Milwaukee, Wisconsin
CPH	Chicago Telephone Supply Co. Elkhart, Indiana
CUT	Cutler-Hammer, Inc. Milwaukee, Wisconsin
DABU	Dale Products, Inc. Columbus, Nebraska
DECN	Delevan Electronics Corp. East Aurora, New York
EMM	Electro Motive Mfg. Co. Willimantic, Connecticut
EN	Elastic Stop Nut Corp. of America Union, New Jersey
ERC	Erie Resistor Corp. Erie, Pennsylvania
FML	Fansteel Metallurgical Corp. North Chicago, Illinois
GAEM	Good All Electric Mfg. Co. Ogallala, Nebraska
GE	General Electric Co. Schenectady, New York
GLT	Gulton Industries, Inc. Metuchen, New Jersey
GOS	Goshen Rubber Co., Inc. Goshen, Indiana
HAEZ	Hopkins Engineering Co. San Fernando, California
ININ	International Instruments, Inc. New Haven, Connecticut
IPC	Industrial Products Co. Division Amphenol-Borg Electronics Corp. Danbury, Connecticut
JFE	Jeffers Electronics Corp. St. Marys, Pennsylvania
KER	Kearfott Mfg. Corp. Newark, New Jersey
LAEF	Leecraft Mfg. Co. New York, New York
MURA	Mura Corporation Great Neck, New York
OAK	Oak Mfg. Co. Chicago, Illinois
PK	Parker-Kalon Corp. New York, New York
SH	Shakeproof Division Illinois Tool Works Elgin, Illinois
SPR	Sprague Electric Co. North Adams, Massachusetts
WKI	Waldes Kohinoor, Inc. Long Island City, New York

PARTS LIST

Reference Designation	Description	ARC Part No.	Manufacturer & Part No.
C101	CAPACITOR, Variable, ceramic, 3 to 12 μμf, 500 vdcw	8743	ERC TS2A-3-NPO
C102	Same as C101		
C103	Same as C101		
C104	CAPACITOR, Fixed, ceramic, 15 μμf ±5 per cent, 350 vdcw	8751	ERC N1400A15J
C105	CAPACITOR, Fixed, ceramic, 8 μμf ±5 per cent, 350 vdcw	21923	ERC N1400A8J
C106	CAPACITOR, Fixed, ceramic, 5 μμf ±0.5 μμf, 350 vdcw	8752	ERC N1400A5D
C107A-E	CAPACITOR, Variable	25779	
C108	CAPACITOR, Fixed, ceramic, 0.022 μf +80 -20 per cent, 500 vdcw	8627-9223	
C109	CAPACITOR, Fixed, mica, 150 μμf ±2 per cent, 500 vdcw	8706-0151	EMM CM15D151G
C110	CAPACITOR, Fixed, mica, 510 μμf ±2 per cent, 300 vdcw	8706-0511	EMM CM15D511G
C111	CAPACITOR, Fixed, ceramic, 100 μμf ±5 per cent, 500 vdcw	4520	ERC 308
C112	Same as C111		
C113	CAPACITOR, Fixed, electrolytic, 1 μf ±20 per cent, 35 vdcw	21485-9101	SPR 150D105X0035A2
C114	Same as C110		
C115	CAPACITOR, Fixed, plastic, 0.1 μf ±5 per cent, 50 vdcw	8802	CLD TWMA1P1-5-5
C116	Same as C108		
C117	Same as C108		
C118	CAPACITOR, Fixed, ceramic, 7 μμf ±0.5 μμf, 350 vdcw	8760	ERC N1400A7D
C119	Same as C101		
C120	Same as C101		
C121	Same as C101		
C122	CAPACITOR, Fixed, paper, 0.047 μf ±20 per cent, 200 vdcw	8890-9473	SPR 196P47302S4
C123	Same as C106		
C124	Same as C108		
C125	Same as C101		
C126	Same as C101		
C127	Same as C101		
C128	CAPACITOR, Fixed, ceramic, 22 μμf ±5 per cent, 500 vdcw	8769-0220	
C129	CAPACITOR, Fixed, ceramic, 20 μμf ±5 per cent, 500 vdcw	8769-0200	
C130	Same as C101		
C131	Same as C101		
C132	Same as C101		
C133	Same as C108		
C134	CAPACITOR, Fixed, mica, 220 μμf ±2 per cent, 500 vdcw	8706-0221	EMM CM15D221G
C135	CAPACITOR, Fixed, electrolytic, 2 μf ±20 per cent, 150 vdcw	8851	SPR 110D205X0150G
C136	Same as C113		
C137	CAPACITOR, Fixed, mica, 369 μμf ±1 per cent, 500 vdcw	8749	EMM VTCM20-369F
C138	CAPACITOR, Fixed, ceramic, 8 μμf ±0.25 μμf, 500 vdcw	8769-9801	
C139	CAPACITOR, Fixed, mica, 745 μμf ±1 per cent, 500 vdcw	8748-0001	EMM VTCM20-745F
C140	CAPACITOR, Fixed, mica, 1740 μμf ±2 per cent, 500 vdcw	8618-0001	EMM VTCM35-1740G

Reference Designation	Description	ARC Part No.	Manufacturer & Part No.
C141	Same as C101		
C142	Same as C101		
C143	Same as C101		
C144	CAPACITOR, Fixed, ceramic, 12 μμf ±5 per cent, 350 vdcw	8750	ERC N1400A12J
C145	Same as C108		
C146[1]	CAPACITOR, Fixed, mica, 510 μμf ±2 per cent, 500 vdcw (p/o Z107 ARC-18171)	8764	EMM VTCM20-510G
C147	CAPACITOR, Fixed, paper, 0.068 μf ±20 per cent, 200 vdcw	8913-9683	SPR 118P68302S4
C148[1]	CAPACITOR, Fixed, ceramic, 8.5 μμf ±0.5 μμf (p/o Z107 ARC-18171)	9045	
C149	Same as C147		
C150[1]	Same as C148		
C151	Same as C113		
C152	Same as C108		
C153	Same as C147		
C154[1]	Same as C146		
C155[1]	Same as C148		
C156[1]	Same as C146		
C157[1]	Same as C146		
C158	Same as C147		
C159[1]	Same as C148		
C160[1]	Same as C146		
C161	Same as C110		
C162	Same as C134		
C163	Same as C110		
C164	Same as C113		
C165	CAPACITOR, Fixed, mica, 330 μμf ±2 per cent, 500 vdcw	8706-0331	EMM VTCM15-331G
C166	Same as C108		
C167	CAPACITOR, Fixed, electrolytic, 10 μf +50 -15 per cent, 25 vdcw	8881-0100	FML PP10B25A2
C168	CAPACITOR, Fixed, ceramic, 0.01 μf ±20 per cent, 1000 vdcw	26068-9103	SPR 36C233
C169	Same as C168		
C170	Same as C168		
C171	Same as C168		
C172	Same as C168		
C173	Same as C168		
C174	Same as C168		
C175	CAPACITOR, Fixed, ceramic, 0.0047 μf +100 -0 per cent, 500 vdcw	8626-9474	
C176	CAPACITOR, Fixed, plastic, 0.01 μf ±20 per cent, 300 vdcw	8835	CLD TWA3S1-10
C177	CAPACITOR, Fixed, mica, 3300 μμf ±5 per cent, 500 vdcw	8909-0332	EMM VTDM20-3300G
C178	CAPACITOR, Fixed, ceramic, 10 μμf ±0.25 μμf, 500 vdcw	8765-0100	
C179	CAPACITOR, Fixed, paper, 0.1 μf ±20 per cent, 100 vdcw	8889-9102	SPR 196P10401S4
C180	Same as C113		
C181	CAPACITOR, Fixed, ceramic (value selected at time of final adjustment)	8769	
DS101	LAMP, Incandescent	31481-0143	MURA TL-6
DS102	Same as DS101		
J101	NOT USED		
J102	CONNECTOR, Receptacle, electrical, type UG-290A/U	11338	IPC 87000

[1]Nonprocurable part shown for reference only.

Reference Designation	Description	ARC Part No.	Manufacturer & Part No.
L101	CHOKE, RF, 39 μh ±10 per cent	8926-0390	DECN 2890-34
L102	CHOKE, RF, 3 μh ±10 per cent	14141	JFE 10100-652
L103	CHOKE, RF, 1 μh ±20 per cent	15406	
L104	REACTOR, 1.5 h	18328	CMPB L-1688
M101	MILLIAMMETER	18428	ININ 104
P1	CONNECTOR ASSEMBLY	26195	
P2	CONNECTOR ASSEMBLY	26526	AMP 126-152
R101	RESISTOR, Fixed, comp, 470 ohms ±5 per cent, 1/2 w	201-0471	AB EB4715
R102	RESISTOR, Fixed, comp, 120,000 ohms ±5 per cent, 1/2 w	201-0124	AB EB1245
R103	RESISTOR, Fixed, comp, 47,000 ohms ±5 per cent, 1/2 w	201-0473	AB EB4735
R104	RESISTOR, Fixed, comp, 1 megohm ±5 per cent, 1/2 w	201-0105	AB EB1055
R105	RESISTOR, Fixed, comp, 330,000 ohms ±5 per cent, 1/2 w	201-0334	AB EB3345
R106	Same as R105		
R107	RESISTOR, Fixed, comp, 100,000 ohms ±5 per cent, 1/2 w	201-0104	AB EB1045
R108	RESISTOR, Variable, comp, 10,000 ohms ±20 per cent, 0.5 w	8915-0103	AB GLU1042SD3028L
R109	RESISTOR, Fixed, comp, 22,000 ohms ±5 per cent, 1/2 w	201-0223	AB EB2235
R110	Same as R103		
R111	RESISTOR, Fixed, comp, 10,000 ohms ±5 per cent, 1/2 w	201-0103	AB EB1035
R112	Same as R107		
R113	Same as R101		
R114	Same as R107		
R115	RESISTOR, Fixed, comp, 4700 ohms ±5 per cent, 1/2 w	201-0472	AB EB4725
R116	Same as R107		
R117	Same as R107		
R118	Same as R111		
R119	RESISTOR, Fixed, comp, 2200 ohms ±5 per cent, 1/2 w	201-0222	AB EB2225
R120	RESISTOR, Fixed, comp, 220,000 ohms ±5 per cent, 1/2 w	201-0224	AB EB2245
R121	Same as R101		
R122[1]	RESISTOR, Fixed, comp, 220,000 ohms ±10 per cent, 1/5 w (p/o Z107 ARC-18171)	204-0224	GBR 998A223K
R123	RESISTOR, Fixed, comp, 120 ohms ±5 per cent, 1/2 w	201-0121	AB EB1215
R124	RESISTOR, Fixed, comp (value selected at time of final test) ±5 per cent, 1/2 w	201-*[2]	AB type EB
R125	Same as R119		
R126[1]	Same as R122		
R127	Same as R104		
R128	RESISTOR, Fixed, comp, 1000 ohms ±5 per cent, 1/2 w	201-0102	AB EB1025
R129	Same as R115		
R130	Same as R107		
R131	Same as R105		
R132	Same as R120		
R133	Same as R120		
R134	RESISTOR, Fixed, comp, 1.5 megohms ±5 per cent, 1/2 w	201-0155	AB EB1555

[1]Nonprocurable part shown for reference only.
[2]To complete part number, replace asterisk with correct value in ohms.

Reference Designation	Description	ARC Part No.	Manufacturer & Part No.
R135	RESISTOR, Fixed, comp, 470,000 ohms ±5 per cent, 1/2 w	201-0474	AB EB4745
R136	NOT USED		
R137	Same as R101		
R138	Same as R109		
R139	RESISTOR, Variable, comp, 500,000 ohms ±20 per cent, 0.5 w	8915-0504	AB GLU5042SD3028L
R140	RESISTOR, Fixed, comp, 330 ohms ±5 per cent, 1/2 w	201-0331	AB EB3315
R141	RESISTOR, Fixed, comp, 510,000 ohms ±5 per cent, 1/2 w	201-0514	AB EB5145
R142	Same as R141		
R143	NOT USED		
R144	NOT USED		
R145	RESISTOR, Fixed, comp, 2700 ohms ±5 per cent, 1/2 w	201-0272	AB EB2725
R146	Same as R107		
R147	Same as R107		
R148	Same as R107		
R149	Same as R135		
R150	Same as R145		
R151	Same as R107		
R152	Same as R107		
R153	Same as R141		
R154	RESISTOR, Fixed, comp, 30,000 ohms ±5 per cent, 1/2 w	201-0303	AB EB3035
R155	Same as R141		
R156	RESISTOR, Fixed, comp, 330 ohms ±5 per cent, 2 w	203-0331	AB HB3315
R157	RESISTOR, Fixed, comp, 100 ohms ±5 per cent, 1/2 w	201-0101	AB EB1015
R158	Same as R104		
R159	RESISTOR, Variable, comp, two sections, 100,000 ohms ±10 per cent, and 10,000 ohms ±10 per cent, 1/4 w with one spst switch	26528	CPH GC2-45
R160	RESISTOR, Fixed, comp, 220 ohms ±5 per cent, 1/2 w	201-0221	AB EB2215
S101	SWITCH, Rotary, ceramic	17807	OAK 68972-JC
S102	Same as S101		
S103	Same as S101		
S104	Same as S101		
S105	Same as S101		
S106	Same as S101		
S107	SWITCH, Rotary, ceramic, 2 position, 1 section	26428	CN 100
S108	SWITCH, Rotary, spst, p/o R159	26528	CPH GC2-45
S109	SWITCH, Toggle, sp three position, momentary action	26423	CUT 8866K2
T101	TRANSFORMER, RF	18592	
T102	TRANSFORMER, RF	18601	
T103	TRANSFORMER, RF	18605	
T104	TRANSFORMER, Modulation	18053	CMPB L1673
T105	TRANSFORMER, RF	18748	
T106	TRANSFORMER, RF	18752	
T107	TRANSFORMER, RF	18756	
T108	TRANSFORMER, RF	18609	
T109	TRANSFORMER, RF	18613	
T110	TRANSFORMER, RF	18617	
T111	Same as T108		

Reference Designation	Description	ARC Part No.	Manufacturer & Part No.
T112	Same as T109		
T113	Same as T110		
T114	TRANSFORMER, RF	18621	
T115	TRANSFORMER, RF	18625	
T116	TRANSFORMER, RF	18629	
T117	NOT USED		
T118	NOT USED		
T119	NOT USED		
T120	TRANSFORMER, Output	20679	CMPB L1883
V101	ELECTRON TUBE, Type 5899	700-0132	
V102	ELECTRON TUBE, Type 6112	700-0139	
V103	Same as V101		
V104	ELECTRON TUBE, Type 5718	700-0122	
V105	Same as V101		
V106	Same as V101		
V107	Same as V101		
V108	ELECTRON TUBE, Type 5896	700-0131	
V109	ELECTRON TUBE, Type 6021	700-0136	
V110	ELECTRON TUBE, Type 5902	700-0133	
V111	Same as V104		
V112	Same as V109		
V113	Same as V110		
V114	Same as V110		
W101	CABLE, Coaxial	18327	
W102	CABLE, Coaxial	18079	
W103	CABLE	18150	
XDS101	LAMPHOLDER	50184-0004	
XDS102	Same as XDS101		
Z101	LOOP AMPLIFIER ASSEMBLY	27830	
Z102	MODULATOR ASSEMBLY	17870	
Z103	ANTENNA ASSEMBLY	27833	
Z104	RF ASSEMBLY, First	17810	
Z105	RF ASSEMBLY, Second	27070	
Z106	OSCILLATOR ASSEMBLY	27010	
Z107	TRANSFORMER, IF	18171	
Z108	Same as Z107		
Z109	TRANSFORMER, IF	18173	

PARTS LIST

Reference Designation	Description	ARC Part No.	Manufacturer & Part No.
C701	CAPACITOR, Fixed, electrolytic, 1 μf ±20 per cent, 35 vdcw	21485-9101	SPR 150D105X0035A2
C702	Same as C701		
C703	CAPACITOR, Fixed, ceramic, 0.022 μf +80 -20 per cent, 500 vdcw	8627-9223	ERC type 25U
C704	CAPACITOR, Fixed, electrolytic, 12 μf +75 -15 per cent, 150 vdcw	24420	SPR 112D126C7150J0
C705	CAPACITOR, Fixed, electrolytic, 2 μf ±20 per cent, 150 vdcw	8851	SPR 110D205X0150G0
C706	Same as C704		
C707	CAPACITOR, Fixed, paper, 0.25 μf ±5 per cent, 400 vdcw	27604-9252	CLD SBXM4P25
C708	CAPACITOR, Fixed, plastic, 0.33 μf ±5 per cent, 400 vdcw	28772-9332	HAEZ J2M4334C
C709	CAPACITOR, Fixed, electrolytic, 47 μf ±20 per cent, 50 vdcw	8924-0470	SPR 109D476X0050F2
C710	Same as C703		
C711	Same as C703		
C712	CAPACITOR, Fixed, plastic, 0.22 μf ±20 per cent, 50 vdcw	8996-9222	GAEM type 601PE
C713	CAPACITOR, Fixed, plastic, 0.68 μf ±10 per cent, 140 vrms	28771-9682	
C714	Same as C703		
C715	Same as C703		
CR701	SEMICONDUCTOR DEVICE, Diode	8931-0401	TI 1N2070
CR702	Same as CR701		
CR703	Same as CR701		
J701	CONNECTOR, Receptacle, electrical	25908	AMP 126-806
K701	RELAY, Armature, 14V	14484	
K701	RELAY, Armature, 28V	14485	
L701	COIL, RF, 2.2 mH ±10 per cent	27483-9221	
L702	REACTOR, 1.5 H	18328	CMPB L-1688
L703	REACTOR, 1.2 mH	21429	CMPB L-2254
Q701	TRANSISTOR	22289	MOTR 2N375
Q702	Same as Q701		
Q703	Same as Q701		
Q704	Same as Q701		
Q705	Same as Q701		
Q706	Same as Q701		
R701	RESISTOR, Fixed, comp, 10,000 ohms ±5 per cent, 1/2 w (used in 28V model)	201-0103	AB EB1035
R701	RESISTOR, Fixed, comp, 3900 ohms ±5 per cent, 1/2 w (used in 14V model)	201-0392	AB EB3925
R702	Same as R701		
R703	RESISTOR, Fixed, comp, 180 ohms ±5 per cent, 1/2 w (used in 28V model)	201-0181	AB EB1815
R703	RESISTOR, Fixed, comp, 82 ohms ±5 per cent, 1/2 w (used in 14V model)	201-0820	AB EB8205

Reference Designation	Description	ARC Part No.	Manufacturer & Part No.
R704	Same as R703		
R705	RESISTOR, Fixed, comp, 47,000 ohms ±5 per cent, 1/2 w	201-0473	AB EB4735
R706	RESISTOR, Variable, comp, 100 ohms ±20 per cent, 1/2 w	8915-0101	AB GLU1012SD3028L
R707	RESISTOR, Fixed, comp, 47 ohms ±5 per cent, 1/2 w	201-0470	AB EB4705
R708	RESISTOR, Fixed, comp, 1600 ohms ±5 per cent, 1 w (used in 28V model)	202-0162	AB GB1625
R708	RESISTOR, Fixed, comp, 820 ohms ±5 per cent, 1/2 w (used in 14V model)	201-0821	AB EB8215
R709	RESISTOR, Fixed, ww, 2 ohms ±5 per cent, 3 w (used in 28V model)	209-9201	DABU RS2-2H
R709	RESISTOR, Fixed, ww, 0.75 ohms ±5 per cent, 3 w (used in 14V model)	209-9752	DABU RS2-R75J
R710	Same as R709 (28V model)		
R711	RESISTOR, Fixed, comp, 3300 ohms ±5 per cent, 1/2 w (used in 28V model)	201-0332	AB EB3325
R711	RESISTOR, Fixed, comp, 820 ohms ±5 per cent, 1/2 w (used in 14V model)	201-0821	AB EB8215
R712	RESISTOR, Fixed, ww, 5 ohms ±3 per cent, 3 w (used in 28V model)	209-9501	DABU RS2-5H
R712	RESISTOR, Fixed, ww, 2 ohms ±3 per cent, 3 w (used in 14V model)	209-9201	DABU RS2-2H
R713	Same as R712		
RT701	RESISTOR, Thermal, 10 ohms ±10 per cent at 25 deg C, 8 MW per deg C	27607	GLT 11-TE2
RT702	Same as RT701		
T701	TRANSFORMER, Toroidal (used in 28V model)	27729-0028	
T701	TRANSFORMER, Toroidal (used in 14V model)	27729-0014	
T702	TRANSFORMER, Output	18329	
T703	TRANSFORMER, Oscillator (used in 28V model)	27535	BERK BTC4412
T703	TRANSFORMER, Oscillator (used in 14V model)	27533	BERK BTC4411
T704	TRANSFORMER, Output power (used in 28V model)	27536	CMPB L-3142
T704	TRANSFORMER, Output power (used in 14V model)	27534	CMPB L-3143
T705	TRANSFORMER, Audio	50381	
T706	TRANSFORMER, Audio output (used in 28V model)	26967	
T706	TRANSFORMER, Audio output (used in 14V model)	26966	

PARTS LIST

Figure & Index No.	ARC Part No.	1 2 3 4 5 6 Description	Units per Assy
1-	32670	GONIOMETER-INDICATOR ASSEMBLY, ARC Type IN-21B . . .	1
1-	33550	GONIOMETER-INDICATOR ASSEMBLY, ARC Type IN-21C . . .	1
-1	33277	. COVER	1
		(ATTACHING PARTS)	
-2	514-0016	. SCREW, Assembled washer, bind. h, brs screw, sst lock- . . washer, blk oxidized, No. 4-40 thd by 1/4 in. lg (SH) (SEMS)	2
		- - - * - - -	
-3	33871-1003	. CONNECTOR, Receptacle, electrical (MS3102R10SL-3P) . . .	1
		(ATTACHING PARTS)	
-4	504-0024	. SCREW, Assembled washer, bind. h, brs screw, sst lock- . . washer, ni pl, No. 4-40 thd by 3/8 in. lg (SH)(SEMS)	4
		- - - * - - -	
-5	33877-1009	. CONNECTOR, Receptacle, electrical (MS24056-1)	1
		(ATTACHING PARTS)	
-6	33878-0001	. NUT, Hexagon (MS24017-2)	1
-7	33878-0002	. WASHER, Lock (SH)(1924-02-00)	1
-8	33878-0003	. RING, Lock (MS24057-2)	1
		- - - * - - -	
-9	31169-0000	. CONNECTOR, Receptacle, electrical (MS3102R16S-1P)	1
		(ATTACHING PARTS)	
-10	504-0024	. SCREW, Assembled washer, bind. h, brs screw, sst lock- . . washer, ni pl, No. 4-40 thd by 3/8 in. lg (SH)(SEMS)	4
		- - - * - - -	
-11	32673-0001	. PLATE, Identification (used in IN-21B only)	1
-11	33553-0001	. PLATE, Identification (used in IN-21C only)	1
-12	33282	. PLATE ASSEMBLY	1
		(ATTACHING PARTS)	
-13	144-0016	. SCREW, Machine, fh, brs, ni pl, No. 4-40 thd by 1/4 in. lg. .	1
-14	8775-0016	. PIN, Spring (MS171432)	2
		- - - * - - -	
-15	33281	. PLATE, Printed	1
		(ATTACHING PARTS)	
-16	504-0040	. SCREW, Assembled washer, bind. h, brs screw, sst lock- . . washer, ni pl, No. 4-40 thd by 5/8 in. lg (SH)(SEMS)	3
-17	104-0040	. SCREW, Machine, bind. h, brs, ni pl, No. 4-40 thd by 5/8 . . in. lg	1
-18	8927-0004	. TERMINAL, Lug	1
		- - - * - - -	
-19	29609-0026	. SPACER	4
-20	33273	. BLOCK	1
		(ATTACHING PARTS)	
-21	504-0016	. SCREW, Assembled washer, bind. h, brs screw, sst lock- . . washer, ni pl, No. 4-40 thd by 1/4 in. lg (SH)(SEMS)	2
		- - - * - - -	
-22	20097-0134	. POST	1
		(ATTACHING PART)	
-23	504-0016	. SCREW, Assembled washer, bind. h, brs screw, sst lock- . . washer, ni pl, No. 4-40 thd by 1/4 in. lg (SH)(SEMS)	1
		- - - * - - -	
-24	33245	. CAM ASSEMBLY	1
		(ATTACHING PARTS)	
-25	504-0016	. SCREW, Assembled washer, bind. h, brs screw, sst lock- . . washer, ni pl, No. 4-40 thd by 1/4 in. lg (SH)(SEMS)	4
		- - - * - - -	
-26	33228	. FIDUCIAL	1
		(ATTACHING PARTS)	
-27	502-0016	. SCREW, Assembled washer, bind. h, brs screw, sst lock- . . washer, ni pl, No. 2-56 thd by 1/4 in. lg (SH)(SEMS)	2
		- - - * - - -	

Figure & Index No.	ARC Part No.	1 2 3 4 5 6 Description	Units per Assy
1-28	33076	. FLANGE ASSEMBLY	1
		(ATTACHING PARTS)	
-29	174-0024	. SCREW, Machine, fil h, brs, blk oxidized, No. 4-40 thd by . . 3/8 in. lg	8
-30	29519	. WASHER, Lock, for No. 4 screw	8
		- - - * - - -	
-31	6376	. WASHER, Flat, 0.130 ID by 0.219 OD by 0.0062 in. thk	1
-32	20249	. WASHER, Rubber, 2-24/32 ID by 3 OD by 0.016 in. thk	1
-33	26050	. WINDOW	1
-34	20250	. GASKET	1
-35	28775	. POINTER ASSEMBLY	1
-36	20261	. RING, Snap	1
-37	33079-0001	. MASK	1
-38	34162	. DIAL	1
		(ATTACHING PARTS)	
-39	152-0012	. SCREW, Machine, bind. h, brs, blk oxide finish, No. 2-56 . . thd by 3/16 in. lg	4
		- - - * - - -	
-40	34156	. PLATE	1
		(ATTACHING PARTS)	
-41	102-0012	. SCREW, Machine, bind. h, brs, ni pl, No. 2-56 thd by 3/16. . in. lg	3
		- - - * - - -	
-42	34144	. GEAR, Spur	1
-43	33083	. WASHER, Formed	1
-44	33092-0001	. GEARING UNIT ASSEMBLY (used in IN-21B)	1
-44	33092-0002	. GEARING UNIT ASSEMBLY (used in IN-21C)	1
-45	33084	. . PLATE ASSEMBLY	1
		(ATTACHING PARTS)	
-46	104-0020	. . SCREW, Machine, bind. h, brs, ni pl, No. 4-40 thd by . . . 5/16 in. lg	3
-47	104-0024	. . SCREW, Machine, bind. h, brs, ni pl, No. 4-40 thd by 3/8 . in. lg	3
		- - - * - - -	
-48	34155	. . FLANGE	1
-49	33089	. . GEAR ASSEMBLY.	1
		(ATTACHING PARTS)	
-50	28665-0012	. . RING, Retaining (WKI)(5100-12-C)	1
-51	17768-0000	. . SHIM	AR
		- - - * - - -	
-52	7117-0000	. . WASHER, Flat, sst, 0.192 ID by 0.281 OD by 0.005 in. thk .	AR
-53	28665-0018	. . RING, Retaining (WKI)(5100-18-C)	1
-54	33270	. . GEAR ASSEMBLY.	1
		(ATTACHING PARTS)	
-55	302-0006	. . SETSCREW, Fluted socket dr, cup point, stl, cad pl, No. . 2-56 thd by 3/32 in. lg	2
		- - - * - - -	
-56	33093	. . POST	3
-57	33148	. . GEAR ASSEMBLY.	1
		(ATTACHING PARTS)	
-58	302-0006	. . SETSCREW, Fluted socket dr, cup point, stl, cad pl, No. . 2-56 thd by 3/32 in. lg	2
		- - - * - - -	
-59	33129	. . GEAR ASSEMBLY.	1
-60	33127	. . GEAR ASSEMBLY.	1
-61	33694	. . GEAR ASSEMBLY.	1
-62	30087	. . GEAR ASSEMBLY (used in IN-21B only)	1
		(ATTACHING PARTS)	
-63	304-0006	. . SETSCREW, Fluted socket dr, cup point, stl, cad pl, No. . 4-40 thd by 3/32 in. lg (used in IN-21B only)	2
		- - - * - - -	

Figure & Index No.	ARC Part No.	1 2 3 4 5 6 Description	Units per Assy
1-64	18007	. . MOTOR (CLIP) (AEC-10-QAB-3A/A612)	1
		(ATTACHING PARTS)	
-65	163-0020	. . SCREW, Machine, fil h, brs, ni pl, No. 3-48 thd by 5/16 . . in. lg	2
-66	4559	. . WASHER, Lock, for No. 3 screw	2
-67	17166	. . TERMINAL, Lug	1
-68	26804-0000	. . CLAMP, Rim clinching	2
-69	26805-0006	. . SPACER	2
		- - - * - - -	
-70	32777	. . GONIOMETER	1
		(ATTACHING PARTS)	
-71	163-0028	. . SCREW, Machine, fil h, brs, ni pl, No. 3-48 thd by 7/16 . . in. lg	3
-72	4559	. . WASHER, Lock, for No. 3 screw	3
-73	26804-0000	. . CLAMP, Rim clinching	3
-74	26805-0003	. . SPACER	3
		- - - * - - -	
-75	18008	. . SYNCHRO, Transmitter (used in IN-21B only) (KER) . . . . (RS911-4A)	1
		(ATTACHING PARTS)	
-76	163-0024	. . SCREW, Machine, fil h, brs, ni pl, No. 3-48 thd by 3/8 . . in. lg (used in IN-21B only)	2
-77	4559	. . WASHER, Lock, for No. 3 screw (used in IN-21B only) . . .	2
-78	17166	. . TERMINAL, Lug (used in IN-21B only)	1
-79	26804-0000	. . CLAMP, Rim clinching (used in IN-21B only).	2
-80	26805-0002	. . SPACER (used in IN-21B only)	2
		- - - * - - -	
-81	33489	. . PLATE ASSEMBLY	1
-82	33227	. . GEAR, Spur (used in IN-21B only)	1
		(ATTACHING PARTS)	
-83	302-0006	. . SETSCREW, Fluted socket dr, cup point, stl, cad pl, No. . 2-56 thd by 3/32 in. lg (used in IN-21B only)	2
		- - - * - - -	
-84	33152	. . GEAR ASSEMBLY.	1
		(ATTACHING PARTS)	
-85	302-0006	. . SETSCREW, Fluted socket dr, cup point, stl, cad pl, No. . 2-56 thd by 3/32 in. lg	2
		- - - * - - -	
-86	33094	. . POST	3
-87	33243	. . POST	4
-88	33205	. . GEARING ASSEMBLY	1
		(ATTACHING PARTS)	
-89	28665-0025	. . RING, Retaining (WKI)(5100-25-MD)	1
-90	21623	. . WASHER, Flat, 0.257 ID by 0.344 OD by 0.0030 in. thk . . .	1
		- - - * - - -	
-91	29857	. . . ARM ASSEMBLY	1
		(ATTACHING PART)	
-92	102-0012	. . . SCREW, Machine, bind. h, brs, ni pl, No. 2-56 thd by . . 3/16 in. lg	1
		- - - * - - -	
-93	29848	. . . PIN, Grooved, headed	1
		(ATTACHING PARTS)	
-94	28665-0012	. . . RING, Retaining (WKI)(5100-12-C)	1
-95	17768-0000	. . . SHIM, sst, 0.128 ID by 0.187 OD by 0.003 in. thk	1
		- - - * - - -	
-96	29849	. . . SPRING, Helical, torsion	1
-97	33248	. . . DIAL, Printed	1
		(ATTACHING PARTS)	
-98	502-0008	. . . SCREW, Assembled washer, bind. h, brs screw, sst . . . lockwasher, ni pl, No. 2-56 thd by 1/8 in. lg (SH)(SEMS)	2
		- - - * - - -	

Figure & Index No.	ARC Part No.	1 2 3 4 5 6 Description	Units per Assy
1-99	33207	. . . PIN, Shoulder	1
-100	30995	. . . WASHER, Flat, sst, 0.380 ID by 0.500 OD by 0.040 in. thk.	1
-101	17831	. . . SPRING, Helical, extension	1
-102	29852	. . . GEAR, Spur	1
-103	30314	. . . GEAR, Spur	1
-104	30996	. . . WASHER, Flat, sst, 0.281 ID by 0.500 OD by 0.062 in. thk.	1
-105	8775-0442	. . . PIN, Spring	1
-106	33208	. . . PLATE ASSEMBLY	1
-107	33224	. . GEAR ASSEMBLY.	1
		(ATTACHING PARTS)	
-108	28665-0018	. . RING, Retaining (WKI)(5100-18-C)	1
-109	7117	. . WASHER, Flat	AR
		- - - * - - -	
-110	33533	. . PLATE ASSEMBLY, Rear	1

NUMERICAL INDEX

Part No.	Figure & Index No.	Total Quantity
AEC-10-QAB-3A/A612	1-64	Ref
MS171432	1-14	Ref
MS24017-2	1-6	Ref
MS24056-1	1-5	Ref
MS24057-2	1-8	Ref
MS3102R10SL-3P	1-3	Ref
MS3102R16S-1P	1-9	Ref
RS911-4A	1-75	Ref
102-0012	1-41	4
	1-92	
104-0020	1-46	3
104-0024	1-47	3
104-0040	1-17	1
144-0016	1-13	1
152-0012	1-39	4
163-0024	1-76	2
163-0020	1-65	2
163-0028	1-71	3
17166	1-67	2
	1-78	
174-0024	1-29	8
17768-0000	1-51	AR
	1-95	
17831	1-101	1
18007	1-64	1
18008	1-75	1
1924-02-00	1-7	Ref
20097-0134	1-22	1
20249	1-32	1
20250	1-34	1
20261	1-36	1
21623	1-90	1
26050	1-33	1
26804-0000	1-68	7
	1-73	
	1-79	
26805-0002	1-80	2
26805-0003	1-74	3
26805-0006	1-69	2
28665-0012	1-50	2
	1-94	
28665-0018	1-53	2
	1-108	
28665-0025	1-89	1
28775	1-35	1
29519	1-30	8
29609-0026	1-19	4
29848	1-93	1
29849	1-96	1
29852	1-102	1
29857	1-91	1
30087	1-62	1
302-0006	1-55	88
	1-58	
	1-83	
	1-85	
30314	1-103	1

Part No.	Figure & Index No.	Total Quantity
304-0006	1-63	2
30995	1-100	1
30996	1-104	1
31169-0000	1-9	1
32670	1-	1
32673-0001	1-11	1
32777	1-70	1
33076	1-28	1
33079-0001	1-37	1
33083	1-43	1
33084	1-45	1
33089	1-49	1
33092-0001	1-44	1
33092-0002	1-44	1
33093	1-56	3
33094	1-86	3
33127	1-60	1
33129	1-59	1
33148	1-57	1
33152	1-84	1
33205	1-88	1
33207	1-99	1
33208	1-106	1
33224	1-107	1
33227	1-82	1
33228	1-26	1
33243	1-87	4
33245	1-24	1
33248	1-97	1
33270	1-54	1
33273	1-20	1
33277	1-1	1
33281	1-15	1
33282	1-12	1
33489	1-81	1
33533	1-110	1
33550	1-	1
33553-0001	1-11	1
33694	1-61	1
33871-1003	1-3	1
33887-1009	1-5	1
33878-0001	1-6	1
33878-0002	1-7	1
33878-0003	1-8	1
34144	1-42	1
34155	1-48	1
34156	1-40	1
34162	1-38	1
4559	1-66	7
	1-72	
	1-77	
502-0008	1-98	2
502-0016	1-27	2
504-0016	1-21	7
	1-23	
	1-25	

Part No.	Figure & Index No.	Total Quantity
504-0024	1-4 1-10	8
504-0040	1-16	3
5100-12-C	1-50 1-94	Ref
5100-18-C	1-53 1-108	Ref
5100-25-MD	1-89	Ref

Part No.	Figure & Index No.	Total Quantity
514-0016	1-2	2
6376	1-31	1
7117-0000	1-52 1-109	AR
8775-0016	1-14	2
8775-0442	1-105	1
8927-0004	1-18	1

REFERENCE DESIGNATION INDEX

Reference Designation	Figure & Index No.	Part No.
B1	1-64	18007
B2	1-70	32777
B3	1-75	18008

Reference Designation	Figure & Index No.	Part No.
J1	1-9	31169-0000
J2	1-5	33877-1009
J3	1-3	33871-1003

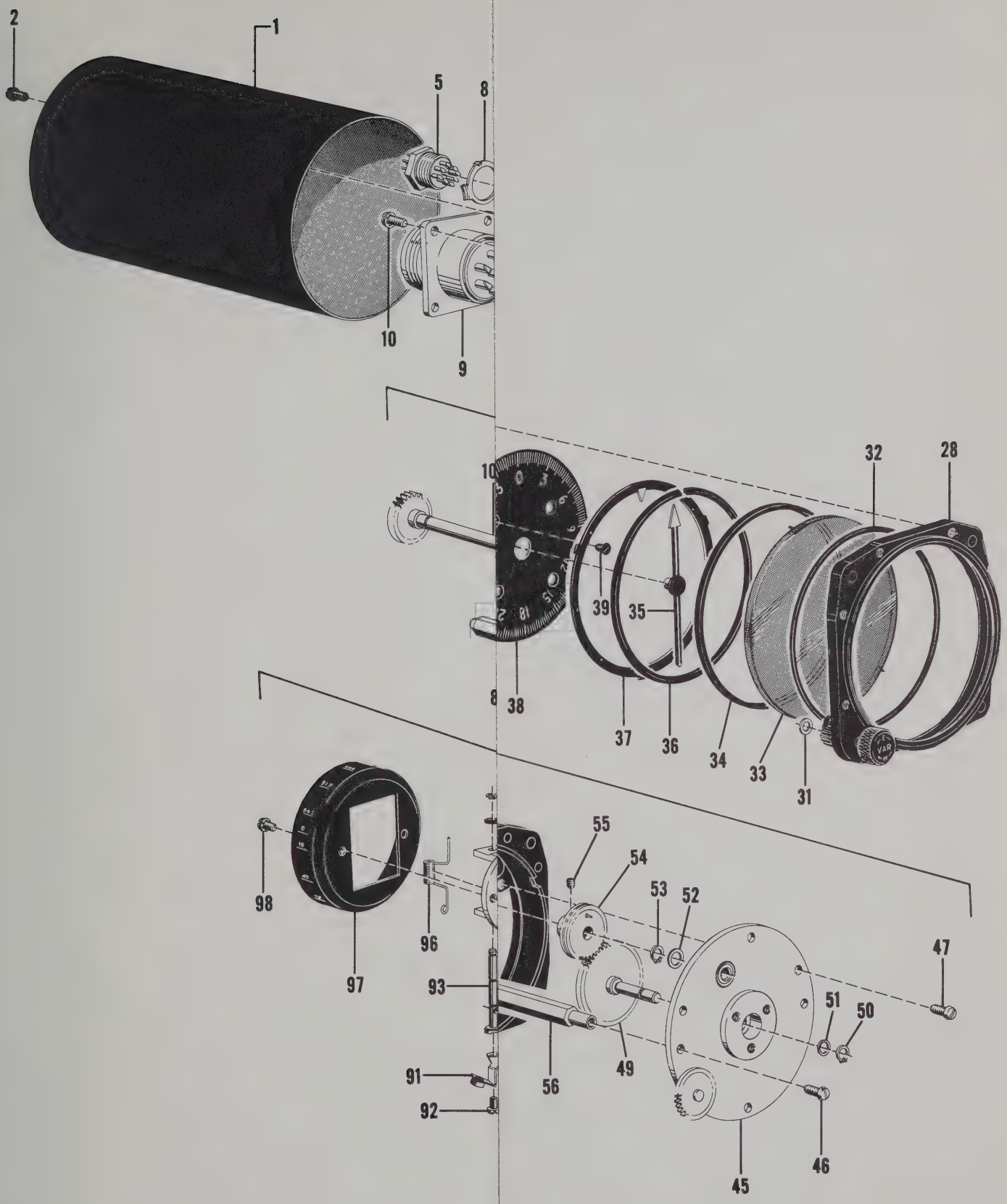


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Figure 1. IN-21B or IN-21C Goniometer-Indicator, Exploded View

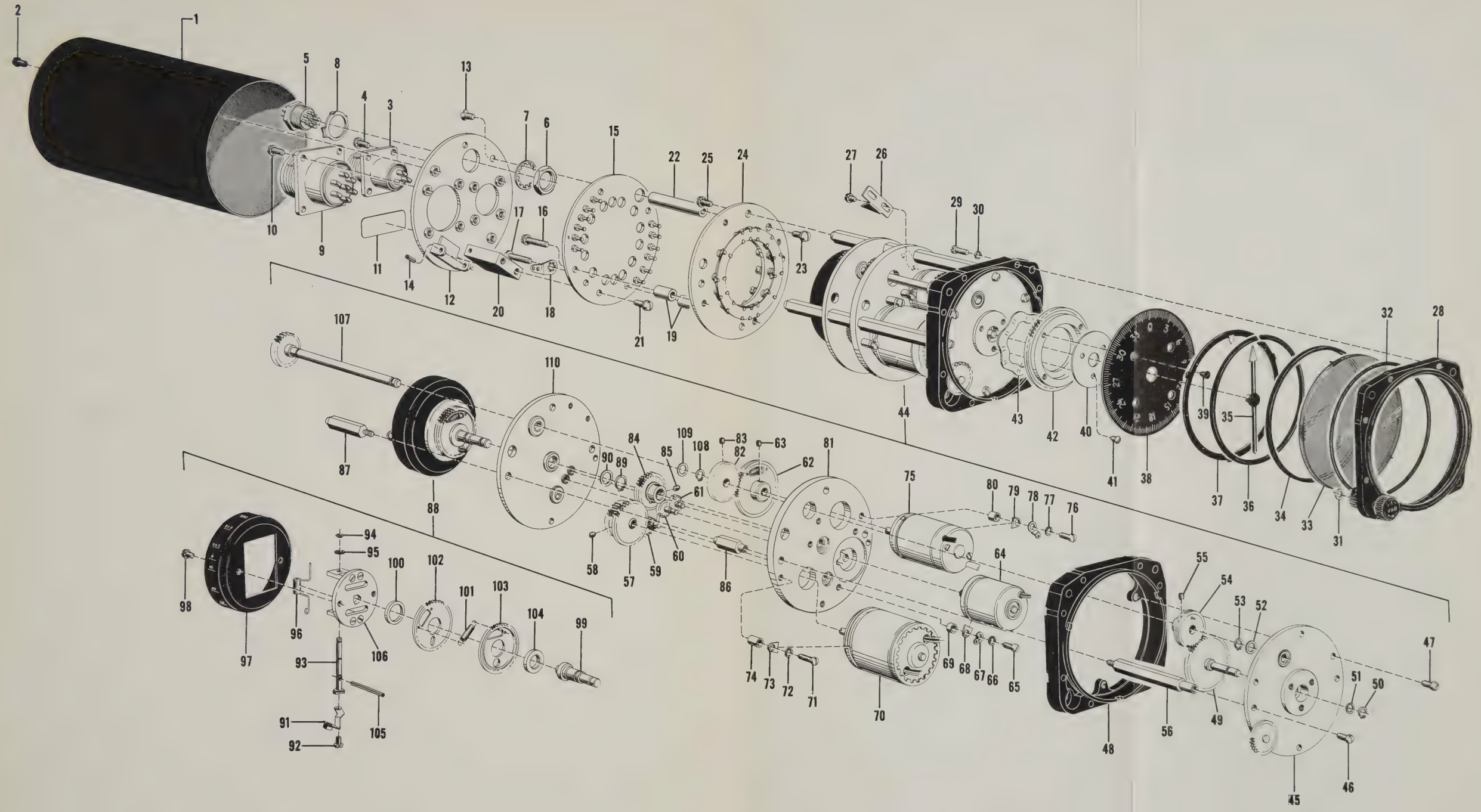
Part No.	Figure & Index No.	Total Quantity
504-0024	1-4 1-10	8
504-0040	1-16	3
5100-12-C	1-50 1-94	Ref
5100-18-C	1-53 1-108	Ref
5100-25-MD	1-89	Ref

Part No.	Figure & Index No.	Total Quantity
514-0016	1-2	2
6376	1-31	1
7117-0000	1-52 1-109	AR
8775-0016	1-14	2
8775-0442	1-105	1
8927-0004	1-18	1

REFERENCE DESIGNATION INDEX

Reference Designation	Figure & Index No.	Part No.
B1	1-64	18007
B2	1-70	32777
B3	1-75	18008

Reference Designation	Figure & Index No.	Part No.
J1	1-9	31169-0000
J2	1-5	33877-1009
J3	1-3	33871-1003



TP4245

Figure 1. IN-21B or IN-21C Goniometer-Indicator, Exploded View

Dependable Electronic Equipment Since 1928